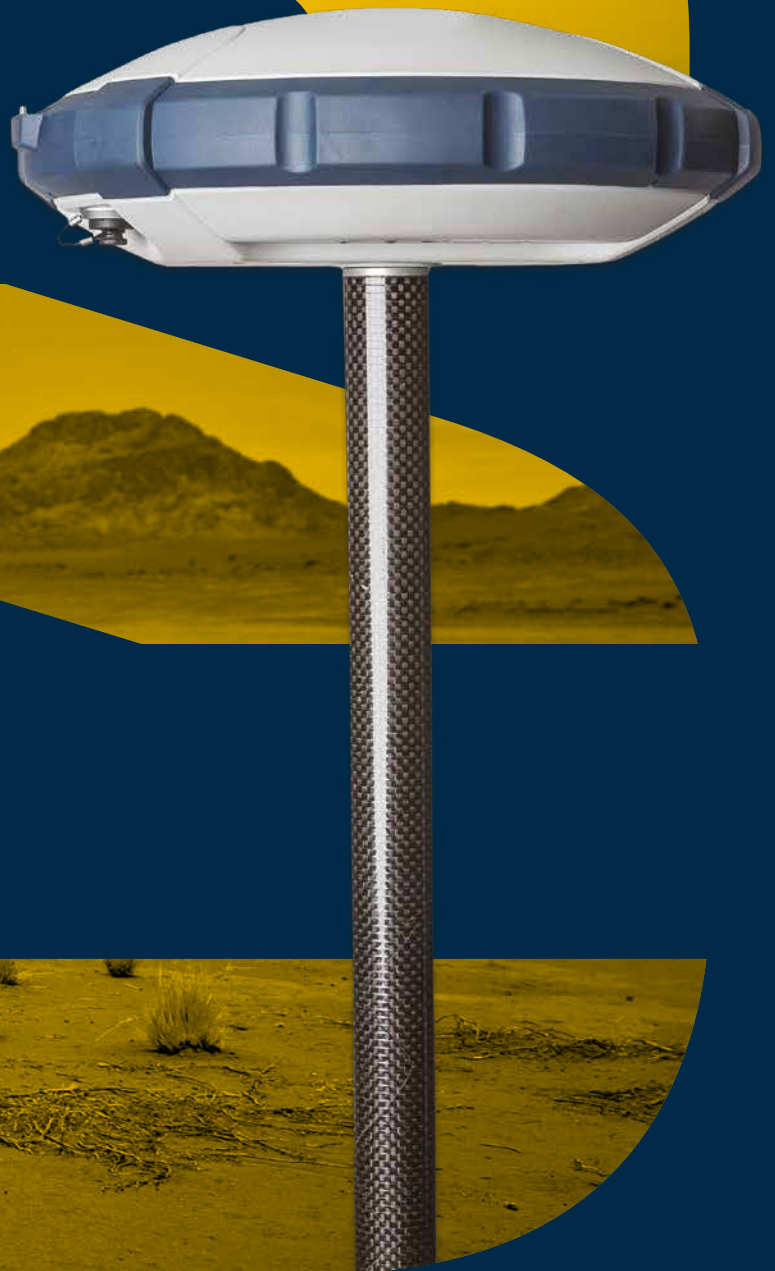# SPECTRA®
GEOSPATIAL

SP60®

SIMPLY VERSATILE

SP60
GNSS RECEIVER

The Spectra Geospatial SP60 is a new generation GNSS receiver offering a high level of flexibility to cover any demand from GIS all the way up to sophisticated RTK and Trimble RTX™ capable solutions.

Combining the unique all-signals-tracking and processing Z-Blade GNSS-centric technology and L-band capability for satellite-delivered Trimble RTX correction services, the SP60 receiver provides the most reliable measurements and the highest possible accuracy under any conditions anywhere in the world.

KEY FEATURES:
- Extended scalability
- Z-Blade GNSS-centric technology
- 240-channel 6G ASIC
- Anti-theft technology
- Long Range Bluetooth
- Trimble RTX correction services

Patented inside-the-rod mounted UHF antenna design

Truly scalable and versatile
Extremely scalable and versatile, SP60 can respond to any type of GIS or surveying job starting with two GIS configurations, to a simple L1 GPS only post-processing solution, all the way up to dual-frequency GNSS network RTK rover. Also, the L-band capable GNSS antenna delivers Trimble RTX positioning in those places where an RTK network is not available. Finally, optional UHF transmit radio or embedded Long Range Bluetooth enable SP60 receivers to be used as a base and rover system. This extended flexibility allows surveyors to start with a simple solution, and through hardware and firmware upgrades, adapt the SP60 to more complex survey jobs.

Unique 6G GNSS-centric technology
Exclusive Z-Blade processing technology running on a next-generation Spectra Geospatial 240-channel 6G ASIC fully utilizes all 6 GNSS systems: GPS, GLONASS, BeiDou, Galileo, QZSS and SBAS. The unique GNSS-centric capability optimally combines GNSS signals without dependency on any specific GNSS system; this allows SP60 to operate in GPS-only, GLONASS-only or BeiDou-only mode if needed. Thanks to this unique GNSS technology, SP60 is optimized for tracking and processing signals even in very challenging environments.

OPEN TO 3RD PARTY CONTROLLERS AND APPLICATIONS
With SP60, consumer devices are no longer limited by their internal GPS and can reach mapping grade or even survey-grade accuracy levels. This solution is also open to any application needing to get an accurate position. The SPace application makes integration immediate and straightforward. With SP60 it is now possible to have accurate positions on an Android consumer smart phone or tablet.

TRIMBLE RTX CAPABLE
Trimble RTX correction services offer a wide range of accuracy requirements ranging from better than 4 cm accuracies, up to sub-meter accuracies, without the need of an RTK base station or cellular coverage. Trimble RTX is available via both satellite and cellular/IP delivery. The premium service, CenterPoint® RTX is the most accurate satellite-delivered correction service available today. The SP60, empowered with an L-band GNSS antenna, supports the entire suite of Trimble RTX correction services via satellite delivery and is ideal for operating in areas where there is no network available and a local base and rover set-up is not possible. With the SP60 GNSS receiver and a Trimble RTX correction, achieve high-accuracy positioning nearly anywhere in the world.

BUILT-IN LONG RANGE BLUETOOTH
SP60 integrates powerful Long Range Bluetooth capabilities opening new operating modes for surveyors. Now, the Bluetooth wireless communication can be used as an alternative radio link between base and rover over a few hundred meters range making this solution very attractive for small site surveys. Easier and simpler than UHF radio, and without any need for a license, this can be a very efficient way to quickly setup a short range base rover solution.

THE SPECTRA GEOSPATIAL EXPERIENCE
Survey Pro or FAST Survey field software provides easy-to-use, yet powerful GNSS workflows, letting the surveyor concentrate on getting the job done. The Survey Office Software provides a complete office suite for data processing and Central cloud computing solution offers a simple to use pathway to data exchange and management. When combined with the most advanced and rugged field data collectors from Spectra Geospatial, SP60 is a very powerful and complete solution.

ANTI-THEFT TECHNOLOGY
Unique anti-theft technology secures SP60 when installed as a field base station in remote or public places and can detect if the product is disturbed, moved or stolen. This technology allows the surveyor to lock the device to a specific location and make it unusable if the device is moved elsewhere. In this case, SP60 will generate an audio alert and block the device from further use. SP60's anti-theft technology provides surveyors with remote security and peace of mind.

ADVANCED DESIGN
In addition to the cutting-edge L-band capable GNSS antenna, and unique Long Range Bluetooth module, the SP60 GNSS receiver design incorporates a number of innovative ideas and enhancements. It features a rugged, impact-resistant housing, easily withstanding 2m pole drops. Waterproof to IP67 standard, it can handle the toughest outdoor conditions. The patented UHF antenna, set inside the fiberglass rod, extends the range of RTK radio performance and provides protection at the same time. All of these enhancements make the design of SP60 GNSS receiver truly unique and powerful.

GNSS CHARACTERISTICS

- 240 GNSS channels
  - GPS L1C/A, L1P(Y), L2P(Y), L2C, L1C
  - GLONASS L1C/A, L2C/A, L1P, L2P
  - QZSS L1C/A, L2C, L1Z, L1C
  - BeiDou B1, B2, B1C
  - Galileo E1, E5b
  - SBAS L1C/A
  - L-band MSS
- Support for Trimble RTX™ real-time correction services
- Patented Z-Blade technology for optimal GNSS performance
  - Full utilization of signals from all 6 GNSS systems (GPS, GLONASS, BeiDou, Galileo, QZSS and SBAS)
  - Enhanced GNSS-centric algorithm: fully-independent GNSS signal tracking and optimal data processing, including GPS-only, GLONASS-only or BeiDou-only solution (autonomous to full RTK)
  - Fast Search engine for quick acquisition and re-acquisition of GNSS signals
- Patented SBAS ranging for using SBAS code & carrier observations and orbits in RTK processing
- Patented Strobe™ Correlator for reduced GNSS multi-path
- Up to 10 Hz real-time raw data (code & carrier and position output)
- Supported data formats: ATOM, CMR, CMR+, RTCM 2.1, 2.3, 3.0, 3.1 and 3.2 (including MSM), CMRx and sCMRx (rover only)
- NMEA 0183 messages output

REAL-TIME ACCURACY (RMS)[1][2]

SBAS (WAAS/EGNOS/MSAS/GAGAN)
- Horizontal: < 50 cm
- Vertical: < 85 cm

Real-Time DGPS position
- Horizontal: 25 cm + 1 ppm
- Vertical: 50 cm + 1 ppm

Real-Time Kinematic position (RTK)
- Horizontal: 8 mm + 1 ppm
- Vertical: 15 mm + 1 ppm

GIS accuracy modes
- 30/30
  - Horizontal: 30 cm
  - Vertical: 30 cm
- 7/2 (firmware option needed)
  - Horizontal: 7 cm
  - Vertical: 2 cm

REAL-TIME PERFORMANCE [3]
- Instant-RTK® Initialization
  - Typically 2 sec for baselines < 20 km
  - Up to 99.9% reliability
- RTK initialization range: over 40 km

POST-PROCESSING ACCURACY (RMS) [1][2]

Static & Fast static
- Horizontal: 3 mm + 0.5 ppm
- Vertical: 5 mm + 0.5 ppm

High-Precision Static [4]
- Horizontal: 3 mm + 0.1 ppm
- Vertical: 3.5 mm + 0.4 ppm

Post-Processed Kinematic (PPK)
- Horizontal: 8 mm + 1 ppm
- Vertical: 15 mm + 1 ppm

DATA LOGGING CHARACTERISTICS

Recording interval
- 0.1 - 999 seconds

PHYSICAL CHARACTERISTICS

Size
- 21 x 21 x 7 cm (8.3 x 8.3 x 2.3 in)

Weight
- 930 g (2.08 lb)

User interface
- Five LEDs for Power, Tracking, Bluetooth, Recording, Radio operations

I/O interface
- RS232 serial link
- USB 2.0/UART and USB OTG
- Bluetooth 2.1 + EDR. Long range: Class 1 (17dbm)

Memory
- 256 MB internal memory NAND Flash
- Over a month of 15 sec. raw GNSS data from 14 satellites

Operation
- RTK rover & base
- RTK network rover: VRS, FKP, MAC
- NTRIP, Direct IP
- Post-processing
- Trimble RTX (satellite and cellular/IP)

Environmental characteristics
- Operating temperature: -40° to +65°C / (-40° to +149°F) [5][6]
- Storage temperature: -40° to +85°C / (-40° to +185°F) [7]
- Humidity: 100% condensing
- IP67 waterproof, sealed against sand and dust
- Drop: 2m pole drop on concrete
- Shocks: MIL STD 810 (fig 516.5-10) (01/2000)
- Vibration : MIL-STD-810F (fig 514.5C-17) (01/2000)

Power characteristics
- Li-Ion battery, 7.4 V, 2600 mAh
- Battery life: 10 hrs (GNSS On, UHF Rx Off) 8 hrs (GNSS On, UHF Rx On)
- External DC power: 9-28 V

Standard system components
- SP60 receiver
- Li-Ion battery
- Dual battery charger, power supply and international power cord kit
- Tape measure (3.6 m / 12 ft)
- 7 cm pole extension
- USB to mini-USB cable
- 2 year warranty

Optional system components
- SP60 UHF Kit (410-470 MHz 2W TRx)
- SP60 Field Power Kit
- SP60 Office Power Kit
- Data collectors
  - Ranger 3
  - T41
  - MobileMapper 50
- Field software
  - Survey Mobile (Android)
  - SPace control app for 3rd party devices (Android)
  - Survey Pro
  - FAST Survey

1. Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality.
2. Performance values assume a minimum of five satellites, following the procedures recommended in the product manual. High multipath areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.
3. Receiver initialization time varies based on GNSS constellation health, level of multipath, and proximity to obstructions such as large trees and buildings.
4. Long baselines, long occupations, precise ephemeris used
5. Internal batteries are rated from -20°C to +48°C
6. At very high temperatures UHF module should not be used in the transmitter mode. With UHF transmitter on radiating 2W of RF power, the operating temperature is limited to + 55°C (+131°F).
7. Without batteries. Batteries can be stored up to +70°C.
8. RMS performance based on repeatable in field measurements. Achievable accuracy and initialization time may vary based on type and capability of receiver and antenna, user's geographic location and atmospheric activity, scintillation levels, GNSS constellation health and availability, and level of multipath including obstructions such as large trees and buildings.

TRIMBLE RTX INITIALIZATION [8]

	Horizontal/Vertical (RMS)	Initialization Std/Fast	GNSS
CenterPoint® RTX	< 4 cm / < 9 cm	< 30 min / < 5 min	L1 + L2
FieldPoint RTX™	10 cm / -	<15 min / < 5 min	L1 + L2
ViewPoint RTX™	< 50 cm / -	< 5 min / -	L1

CONTACT INFORMATION:

Americas
10368 Westmoor Drive
Westminster, CO 80021 • USA
+1-720-587-4700 Phone
888-477-7516 (Toll Free in USA)

Europe, Middle East and Africa
Rue Thomas Edison
ZAC de la Fleuriaye – CS 60433
44474 Carquefou (Nantes) • FRANCE
+33-(0)2-28-09-38-00 Phone

Asia-Pacific
80 Marine Parade Road
#22-06, Parkway Parade
Singapore 449269 • SINGAPORE
+65-6348-2212 Phone

Please visit www.spectrageospatial.com for the latest product information and to locate your nearest distributor. Specifications and descriptions are subject to change without notice.

ProFlex™ 800

powered by **ashtech**

SPECTRA PRECISION

Outstanding GNSS Performance in Ultra Rugged Design

FLEXIBLE
RELIABLE RTK
PRODUCTIVE

MULTI GNSS

Z BLADE
TECHNOLOGY INSIDE

ProFlex™ 800 Powerful Positioning Solution

ProFlex 800 is a powerful positioning solution that delivers state-of-the-art RTK features in a rugged, highly integrated receiver design. The new Z-Blade GNSS centric technology uses all available GNSS signals equally (without preference to any particular constellation) to deliver fast and stable RTK solutions. Z-Blade helps ProFlex 800 achieve optimal results, even in environments where GPS coverage is insufficient, like urban canyons or under tree canopy.

The ProFlex 800 operates as either a base or a rover and is available with different application packages to suit your needs.

ProFlex 800 with Z-Blade technology is a perfect back-pack rover or reference station solution for precise land surveying. Its innovative design makes it ideal for onboard system integration - it can be mounted easily on a machine or vehicle for land or sea operations.

- Unique Z-Blade technology for outstanding GNSS performance in harsh environments
- Fast initialization and centimeter accuracy at long-range
- Wide variety of built-in communication features (including internal transceiver)
- Hot-Standby RTK feature automatically selects the best available position
- Rugged and waterproof design for harsh outdoor conditions
- Interoperability with any vendor's reference station transmitting GPS+GLONASS L1/L2 (VRS, FKP or MAC)
- Flexible GNSS receiver for multiple applications
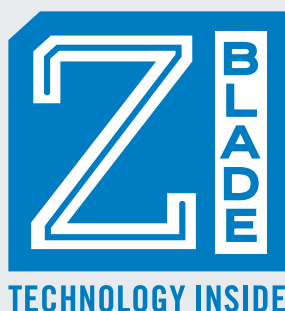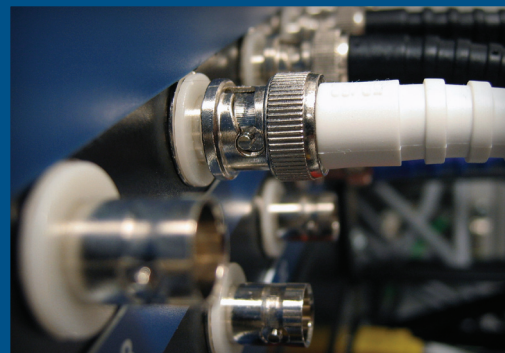
New Z-Blade Technology

Z-Blade is new GNSS centric signal processing technology from Ashtech. Z-Blade optimally processes all of the available satellite signals, maximizing your ability to obtain reliable GNSS position in tough conditions.

Z-Blade allows you to get and maintain RTK solutions even if GPS coverage is insufficient. In many work locations just a few GPS and GLONASS satellites may be visible due to obstacles such as trees or buildings. Thanks to Z-Blade technology, ProFlex 800 can still deliver high-quality positions to keep you working productively.

- New GNSS centric signal processing technology from Ashtech
- Get and maintain RTK solutions even if GPS coverage is insufficient
- Achieve a rapid and reliable RTK fix, even in harsh environments like urban canyons or tree canopy

Flexibility & Ruggedness

The ProFlex 800 offers a unique design with various mounting capabilities. It includes a wide range of built-in communication options, internal removable battery, internal memory, specific kits per application and full compatibility with various software solutions.

The weatherproof, high-impact-resistant molded aluminum housing ensures your investment is safe in all conditions, which is especially important for onboard machine usage or base station applications.

Adaptable to most any specific positioning usage, the ProFlex 800 is the ideal solution for people looking for a single GNSS receiver for multiple applications.

Application Packages

Survey Backpack

Surveyors will appreciate ProFlex 800's ability to operate in tougher environments than ever before. The survey backpack kit includes a robust and comfortable water-resistant backpack, a UHF pole and cable, a GPS cable, a second Li-ion battery and office software for project and geoid management.

Onboard Machine Integration

Ready for system integration, ProFlex 800 is a great GNSS solution for OEM manufacturers and VARs needing precise positioning for machine guidance/control applications, such as agriculture, construction or mining. The kit includes all the cables (serial cables, USB cable, 10 m GPS and UHF cable, power cable to connect on an external battery) you need to build the right setup.

Base Station and Continuously Operating Reference Station

With its built-in Ethernet capability and embedded Web Server, you can access, control and monitor ProFlex 800 from any computer connected to the Internet. Use the capability for instant real-time multi-data streaming over Ethernet to build your own RTK corrections server without any additional software or equipment. If a cellular network is available, ProFlex 800 offers surveyors an efficient alternative to RTK networks (public or private) eliminating radio propagation issues.

Wireless communication

In addition to a 3.5G internal cellular modem, ProFlex 800 accommodates a wide variety of UHF kits (internal and external UHF modules) providing stable and reliable wireless communication between base and rover. ProFlex 800 even supports an internal transceiver for ultimate flexibility. It can then be used as a rover or a base without additional accessories in the field. Z-Blade long range RTK capability combined with industry-leading UHF expertise ensure you maximal productivity.

ProFlex 800 Technical Specifications

GNSS Characteristics
- 120 channels:
  - GPS L1 C/A, L1/L2 P, L2C, L5
  - GLONASS L1 and L2 C/A
  - GALILEO E1 and E5 (including GIOVE-A and GIOVE-B test satellites)
  - SBAS (WAAS / EGNOS / MSAS)
  - Fully independent code and phase measurement
- Z-Blade technology for optimal GNSS performance
  - Ashtech GNSS centric algorithm: fully independent GNSS signal tracking and processing
  - Quick signal detection engine for fast acquisition and re-acquisition of GNSS signals
  - Fast and stable RTK solution
- Up to 20 Hz real-time raw data and position output
- Advanced multi-path mitigation technique
- RTK base and rovers modes, post-processing

Real-Time Accuracy (RMS)[2,3]
SBAS (WAAS/EGNOS/MSAS)
- Horizontal < 50 cm (1.64 ft)
Real-Time DGPS position
- Horizontal: 25 cm (0.82 ft) + 1 ppm[4]
RTK
- Horizontal: 1 cm (0.033 ft) + 1 ppm[4]
- Vertical: 2 cm (0.065 ft) + 1 ppm[4]
Flying RTK
- 5 cm (0.165 ft) + 1 ppm (steady state) horizontal for baselines up to 1000 km

Real-Time Performance
- Instant-RTK Initialization
  - Typically 2-second initialization for baselines < 20 km
  - Up to 99.9% reliability
- RTK Initialization range
  - > 40 km

Post Processing Accuracy (RMS)[2,3]
- Static, Rapid Static
  - Horizontal 5 mm (0.016 ft) + 0.5 ppm
  - Vertical 10 mm (0.033 ft) + 1 ppm
- Long Static[5]
  - Horizontal 3 mm (0.009 ft) + 0.5 ppm
  - Vertical 6 mm (0.019 ft) + 0.5 ppm
- Post-Processed Kinematic
  - Horizontal 10 mm (0.033 ft) + 1.0 ppm
  - Vertical 20 mm (0.065 ft) + 1.0 ppm

Data Logging Characteristics
Recording Interval
- 0.05 - 999 seconds
Memory
- 128 MB internal memory
- Ring File Memory function offering unlimited use of the storage medium
- Memory is expandable through external USB sticks or hard drives

Sessions
- Up to 96 sessions per day
- Embedded RINEX converter
- Enhanced Automatic FTP push function

Embedded RINEX convertor
- RINEX 2.11 and 3.01 are supported
- Converting on-the-fly
- Up to two RINEX files with two different rates simultaneously

RTK Base
- RTCM-2.3 & RTCM-3.1
- CMR & CMR+
- ATOM™ & DBEN (proprietary formats)

RTK Rover
- Up to 20 Hz Fast RTK position output
- RTCM-2.3 & RTCM-3.1
- CMR & CMR+
- ATOM, DBEN & LRK (proprietary formats)
- Networks: VRS, FKP, MAC
- NTRIP protocol
- NMEA0183 messages output

Embedded Web Server
- Password-protected Web Server
- Full receiver monitoring and configuration
- FTP push function
- Embedded FTP server and NTRIP caster
- NTRIP Server and instant real-time multi-data streaming over Ethernet
- DHCP or manual configuration (static IP address)
- DynDNS® technology support

Full MET/TILT Sensor Integration
- Both sensor types can be connected simultaneously
- Met and Tilt data can be:
  - Logged and downloaded together with the GNSS data
  - Streamed in real time

I/O Interface (Rugged, Waterproof Connectors)
- 1 x RS232/RS422 up to 921.6 kbits/sec
- 2 x RS232 up to 115.2 kbits/sec
- USB 2.0 host and device
- Bluetooth 2.0 + EDR Class 2, SPP profile
- Ethernet (Full-Duplex, auto-negotiate 10 Base-TX / 100 Base-TX)
- PPS output
- Event marker input
- 12V/0.5A (1A peak) output available on serial port A
- Optically isolated I/O interface (except USB)
- Ready for CAN bus (NMEA200 compatible)

Physical Characteristics
Size
- Unit: 21.5x20x7.6 cm (8.46x7.87x2.99 in)
Weight
- GNSS receiver: from 2.1 kg (4.6 lb)

Environmental Characteristics
- Operating temperature: -30° to +65°C (-22° to +149°F)
- Storage temperature: -40° to +70°C (-40° to +158°F)
- Humidity: 100% condensing
- IP67 (waterproof and dustproof)
- Salt mist as defined in EN60945
- Shock: MIL-STD 810F, Fig. 516.5-10
- Vibration: MIL-STD 810F, Fig. 514.5C-17

Power Characteristics
- Li-ion battery, 32.5Wh (7.4Vx4.4Ah). Acts as a UPS in case of a power source outage
- Battery life time: > 6.5 hours @20°C (68°F) with UHF rover configuration
- 9-36 VDC input (Reverse polarity protected)
- Typical power consumption with GNSS antenna: < 5W
- Supporting transient voltage according to EN2282 with 28V input voltage
- Programmable sleep mode
- External DC power limits feature

Certifications
- R&TTE directive compliance (CE)
- FCC/IC

Complementary System Components
Internal UHF Kits
- Pacific Crest Tx/Rx (both base and rover)
- U-Link Rx (rover only)
External UHF transceiver Kits
- Pacific Crest Tx/Rx
- U-Link Tx/Rx
Built-in 3.5 G Modem
- UMTS/HxDPA: 2100,1900,850MHz; Tri-Band
- GSM/GPRS/EDGE: 850,900,1800,1900,2100 MHz; Quad-Band
- GPRS/EDGE multislot class 12
- Automatic detection 2G-3G
- GCF and PTCRB approved
Antennas
- Geodetic: GNSS Survey antenna, 38dB gain
- Choke Ring: GNSS Choke Ring antenna, 39dB gain
- Onboard: GNSS Machine / Marine antenna, 38dB gain
Field software
- FAST Survey, Survey Pro
Office software
- GNSS Solutions, Survey Office, RTDS

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[1] All the available GNSS signals are processed equally and combined without preference to any particular constellation for optimal performance in harsh environment.

[2] Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath, and satellite geometry. Position accuracy specifications are for horizontal positioning. Vertical error is typically < 2 times horizontal error.

[3] Performance values assume minimum of five satellites, following the procedures recommended in the product manual. High multi-path areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.

[4] Steady state value for baselines < 50 km after sufficient convergence time.

[5] Long baselines, long occupations, precise ephemeris used.

SCAN THIS CODE FOR MORE INFORMATION

ProFlex™ 500

Flexible Rugged
High-Performance GNSS Receiver
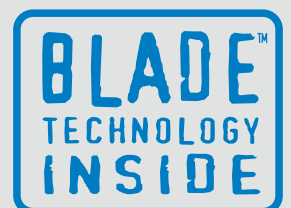
ProFlex™500

Designed by our GNSS experts, the new ProFlex 500 is a powerful positioning solution that delivers state-of-the-art RTK features in a rugged, highly integrated receiver design. Embedded BLADE™ technology ensures powerful RTK performance and a patented way to use multiple GNSS constellations for high-accuracy positioning and surveying solutions. The ProFlex 500 works as either a base or a rover and is available in a variety of configurations from L1 DGPS up to L1/L2 GPS+GLONASS+SBAS, with different application packages to adapt to various customer needs.

Its innovative design makes it the ideal solution for onboard system integration - it can be mounted easily on a machine or vehicle for land or sea operations - and it is also a perfect back-pack rover or reference station solution for precise land surveying.

ProFlex 500 offers GPS+GLONASS+20 years of field-proven professional technologies. It is made to withstand harsh environments, and gives you maximum flexibility in the field.

- Fast initialization and centimeter accuracy at long-range
- Unique BLADE technology for full benefit of any available GLONASS corrections
- Unique built-in communication features
- Hot-Standby RTK feature for automatic best position availability
- Rugged design for demanding work environments
- Advanced multi-path mitigation and robust signal tracking for maximum data reliability
- Interoperability with any vendor's reference station transmitting GPS+GLONASS L1/L2

High-End Performance

The ProFlex 500 with BLADE has the ability to provide the best possible measurements from three constellations GPS+GLONASS+SBAS – one of the key differentiators offered by our BLADE technology. The receiver itself makes all the checks and preparations needed to mitigate any negative effects of GLONASS signal instabilities. The result is more reliable measurement processing and usage than with competing receiver offerings. Additionally, the ProFlex 500 can work with any other manufacturer's base or reference stations (VRS, FKP or MAC formats supported).

Ruggedness

The innovative design integrates all the communication components (GSM/GPRS and/or UHF radios) offering an all-in-one robust solution to the user. The weatherproof, high-impact resistant molded aluminum housing ensures your investment is safe in all conditions, which is especially important for onboard machine usage or base station applications.

Flexibility

The ProFlex 500 offers a unique design with various mounting capabilities. It includes a unique set of built-in communication options, internal and removable battery, internal memory, specific kits per application and full compatibility with various software solutions such as FAST Survey™, GNSS Solutions™ and Real Time Data Server (RTDS™).

Adaptable to most any specific positioning usage, the ProFlex 500 is also the ideal solution for people looking for a single GNSS receiver for multiple applications.

Survey Backpack

This kit is the ideal package for using your ProFlex 500 in the field for surveying. It includes a robust and comfortable water-resistant backpack specifically designed for ProFlex 500 and its accessories, a UHF pole and cable, a GPS cable with a smart quick-release system, a second Li-ion battery, a tape measure and our GNSS Solutions software for project and geoid management.

Marine

GPS and UHF Marine Aerial Kits are available for the ProFlex 500 for easy and powerful installation onboard ships. Specifically designed for coastal works, dredging, bathymetry or offshore user needs, it includes low-loss GPS or UHF cables (10 or 30 meters), UHF antenna and rugged mounting parts. Our BLADE long range RTK capability combined with our UHF expertise will allow you to increase your productivity.

Onboard Machine Integration

Ready for system integration, ProFlex 500 is a great GNSS solution alternative for OEM manufacturers and VARs who need precise positioning for the machine guidance/control markets, such as agriculture, construction or mining. Contact us to see how you can fully benefit from our unique BLADE technology for your application.

Base Station and Continuously Operating Reference Station

With its built-in Ethernet capability and embedded Web Server, you may access your ProFlex 500 from any computer connected to the Internet to control and monitor your equipment.

With its capability for instant real-time multi-data streaming over Ethernet, you may build your own RTK corrections server without any additional software or equipment. It enables surveyors to have an efficient alternative to RTK networks (public or private) and also solve radio propagation issues, provided a GPRS cellular network is available.
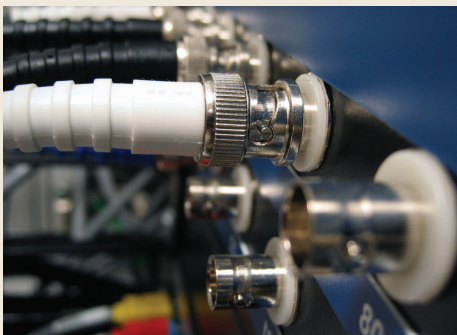
Connectivity

In addition to those already provided within the standard configuration, this kit includes all the cables (serial cables, USB cable, 10m GPS cable, 10m UHF cable, power cable to connect on an external battery), and will allow you to always find the right set-up, and optimize the operational use of your receiver, either as a rover, a base or onboard a vehicle.

These application packages are detailed on our web site, please visit ashtech.com to download specific PDF documentation.

GNSS Characteristics

- 75 channels:
  - GPS L1 C/A L1/L2 P-code, L2C, L1/L2 full wavelength carrier
  - GLONASS L1 C/A, L2 C/A code, L1/L2 full wavelength carrier
  - SBAS L1 code & carrier (WAAS / EGNOS / MSAS)
  - Quick signal detection engines for fast acquisition and re-acquisition of GPS / GLONASS / SBAS signals
  - Fully independent code and phase Measurements
- BLADE technology for optimal performance
- Advanced multi-path mitigation
- Up to 20 Hz raw data and position output
- RTK base and rover modes, post-processing
- L5, Galileo upgradeable

Data Logging Characteristics

Recording Interval
- 0.05 - 999 seconds

Memory
- 128 MB internal memory, expandable through USB sticks or external hard drives
- Ring File Memory function offering unlimited use of the storage medium

Sessions
- Up to 96 sessions per day
- Embedded Rinex converter
- Automatic ftp push function

Ring File Buffer
- Concurrent and independent to sessions raw data recording to collect data with different user settings like update rate

Embedded Web Server

- Web 2.0 Technology
- Password-protected Web Server for Administrator and Users
- DHCP or manual configuration (static IP address)
- Full receiver monitoring and configuration
- FTP push function
- Embedded FTP server
- NTRIP Server and instant real-time multi-data streaming over Ethernet
- Email alerts for automatic notification of status

Full MET/TILT Sensor Integration

- Both sensor types can be connected simultaneously
- Met and Tilt data can be:
  - Logged and downloaded together with the GNSS data (legacy D-File supported)
  - Streamed in real time

RTK Base

- RTCM-2.3 & RTCM-3.1
- CMR™ & CMR+
- ATOM™ (proprietary format)

RTK Rover

- BLADE technology
- Up to 20 Hz Fast RTK
- RTCM-2.3 & RTCM-3.1
- CMR & CMR+
- ATOM, DBEN & LRK (proprietary formats)
- Networks: VRS, FKP, MAC
- NTRIP protocol
- NMEA0183 messages output

Real-Time Position Accuracy[1]

Autonomous
- CEP: 3.0 m (9.84 ft)
- 95%: 5.0 m (16.4 ft)

SBAS Differential
- 0.9 m (RMS)(2.95 ft)

Differential (Local Base Station)
- CEP: 40 cm (1.31 ft)
- 95%: 90 cm (2.95 ft)

RTK (kinematic)
- Fixed RTK
  - Horizontal 1 sigma: 1 cm (0.033 ft) + 1 ppm[2,3]
  - Vertical 1 sigma: 2 cm (0.066 ft) + 1 ppm[2,3]
- Flying RTK
  - CEP: 5 cm (0.16 ft)+ 1 ppm[2,3]
  - CEP: 20 cm (0.66 ft) + 1 ppm[2,4]

Real-Time Performance

- Instant-RTK Initialization
  - Typically 2-second initialization for baselines < 20 km
  - 99.9% reliability
- RTK Initialization range
  - > 40 km

Post Processing Accuracy (rms)[1-2]

- Static, Rapid Static
  - Horizontal 5 mm (0.016 ft) + 0.5 ppm
  - Vertical 10 mm (0.033 ft) + 1 ppm
- Long Static[5]
  - Horizontal 3 mm (0.009 ft) + 0.5 ppm
  - Vertical 6 mm (0.019 ft) + 0.5 ppm
- Post-Processed Kinematic
  - Horizontal 10 mm (0.033 ft) + 1.0 ppm
  - Vertical 20 mm (0.065 ft) + 1.0 ppm

I/O Interface (Rugged, Waterproof Connectors)

- 1 RS232/RS422 up to 921.6 kbits/sec
- 2 RS232 up to 115.2 kbits/sec
- USB 2.0 host and device
- Bluetooth 2.0 + EDR Class 2, SPP profile
- Ethernet (Full-Duplex, auto-negotiate 10 Base-TX / 100 Base-TX)
- 1 PPS output
- Event marker input
- Earth terminal
- 12V/0.5A (1A peak) output available on serial port A
- All signals available are optically isolated from receiver's internal circuitry (except USB)

Physical Characteristics

Size
- Unit: 21.5x20x7.6 cm (8.46x7.87x2.99 in)

Weight
- GNSS receiver: from 2.1 kg (4.6 lb)

Environmental Characteristics

- Operating temperature: -30° to +65°C (-22° to +149°F)
- Storage temperature: -40° to +70°C (-40° to +158°F)
- Humidity: 100% condensing
- IP67 (waterproof and dustproof)
- Salt mist as defined in EN60945
- Shock: MIL-STD 810F, Fig. 516.5-10 (40g, 11ms, saw-tooth)
- Vibration: MIL-STD 810F, Fig. 514.5C-17

Power Characteristics

- Li-ion battery, 32.5Wh (7.4Vx4.4Ah). Acts as a UPS in case of a power source outage
- Battery life time: > 6.5hrs @ 20 ℃ (68°F)
- 9-36 VDC input
- Typical power consumption with GNSS antenna: < 5W

Complementary System Components

Transmitter Kits
- U-Link TRx
- Pacific Crest UHF

Rover Communication Modules
- U-Link Rx
- Pacific Crest UHF
- GSM/GPRS/EDGE (class 10) Quad-band

Antennas
- Geodetic: GNSS Survey antenna, 38dB gain
- Choke Ring: GNSS Choke Ring antenna, 39dB gain
- Onboard: GNSS Machine / Marine antenna, 38dB gain

Software Solutions
- GNSS Solutions, RTDS, FAST Survey

Field Terminal kit with FAST Survey

Connectivity kit

[1] Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath, and satellite geometry. Position accuracy specifications are for horizontal positioning. Vertical error is typically < 2 time's horizontal error.
[2] Performance values assume minimum of five satellites, following the procedures recommended in the product manual. High multi-path areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.
[3] Steady state value for baselines < 50 km after sufficient convergence time.
[4] Typical values after 3 minutes of convergence for baselines < 50 km.
[5] Long baselines, long occupations, precise ephemeris used.

ashtech
BY MAGELLAN PROFESSIONAL

SATELLINE®-EASy Pro

Wireless World – Local Solution

SATELLINE-EASy Pro is an IP67 (NEMA 6) classified UHF radio modem with a high power (up to 25 or 35 W) transmitter and wide 70 MHz tuning range. It was designed for easy mobile use in demanding field conditions. According to the IP67 standard, the casing and connectors of the SATELLINE-EASy Pro are waterproof and secured against dust.

In addition to the high output power and wide tuning range, the channel spacing is also selectable to be 12.5, 20 or 25 kHz. The SATELLINE-EASy Pro is equipped with a Liquid Crystal Display (LCD) and a keypad, used to indicate the current operating status, as well as for changing the operating channel and power level of the radio modem.

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
Customer Specific

With SATEL radio modems, setting up a local data transfer network is quick and cost effective. Your wireless network is independent and free of operator services. The cost of operation is either free of charge or fixed, depending on the frequency used. SATELLINE radio modems are type-approved in over 50 countries. For the latest information, please visit our website www.satel.com.

SATELLINE radio modems are always on line, and provide reliable, real-time data communications over distances ranging from tens or hundreds of metres up to around 80 kilometres. Thanks to a store and forward function, any radio modem in a network can be used as a master station, substation and / or repeater.

SATELLINE radio modem networks are flexible, easy to expand and can cover a wide variety of solutions from simple point-to-point connections to large networks comprising hundreds of modems. Even for expanded networks, only one operating frequency is required.

SATEL®

Heavy-duty tool for outdoor use

SATELLINE-EASy Pro is an IP67 classified UHF radio modem with a high power (up to 25 or 35 W) transmitter, wide 70 MHz tuning range (403 ... 473 MHz) in one hardware and selectable channel spacing.

SATELLINE-EASy Pro is particularly well suited for mobile field applications (land surveying, for instance) under varying weather conditions. Due to the high transmitting power, connection distances more than 80 kilometres can be covered in favourable conditions.

With the Liquid Crystal Display (LCD) the user can monitor the current operating status (frequency, channel number) as well as condition (power level, voltage level, field strength) of the radio modem.

SATELLINE-EASy Pro is compatible with SATELLINE-EASy and -3AS family products too.

Dependable data transfer

In the SATELLINE-EASy Pro the error rate is minimized by means of advance checking and correction of the data packets. In Forward Error Correction (FEC), the data packets are split in several blocks. The radio modem adds correction information inside the blocks during transmission.

In a SATELLINE-EASy Pro network, any substation can function as a repeater, too. In this operating mode (store and forward), the radio modem receives a message, buffers the received data, and transmits it further to another substation, using the same radio channel as in reception.

SATELLINE-EASy Pro features embedded Message Routing software, which takes care of routing messages across a radio modem network automatically after proper settings have been made. Communication is completely transparent, which makes Message Routing directly compatible with most user protocols.

Expert's help always at hand

With an experience of over twenty years, SATEL Oy has grown to one of the leading radio modem manufacturers in the world. As a result of our persistent and innovative work in both product design and international marketing, we now possess extremely large selection of radio modems, and operate through an extensive and skilled distributor network all over the world. We have also accumulated a considerable amount of know-how in different radio modem applications. So, whatever your application is, do not hesitate to ask for expert's help whenever needed.

SATELLINE radio modems have been used, for example, at airports and in waterworks and electricity plants for different monitoring and control applications, as well as to set up location data based fleet management systems in cities. For further information about our products and their applications, please see our home page www.satel.com or contact your local dealer.

Manufacturer:

SATEL Oy
Meriniitynkatu 17, P.O. Box 142,
FI-24101 Salo, FINLAND

Tel. +358 2 777 7800   info@satel.com
Fax +358 2 777 7810   www.satel.com

Technical specifications SATELLINE-EASy Pro

SATELLINE-EASy Pro complies with the following international standards: EN 300 113-1, -2, EN 301 489-1, -5, IEC 60950 and FCC CFR47 section 90.

TRANSCEIVER	
Frequency Range	403…473 MHz
Tuning Range	70 MHz
Channel Spacing	12.5 / 20 / 25 kHz (SW selectable)
Frequency Error Tolerance	< 1 kHz
Type of Emission	F1D
Communication Mode	Half-Duplex

TRANSMITTER	
Carrier Power	10, 20, 25 or 35 W / 50 ohm (Default) 5, 10, 20 or 25 W / 50 ohm (Option *)
Carrier Power Stability	(+ 2 dB / - 3 dB)
TX Duty Cycle ** 35 W 10 W	100 % (22 °C / 35 °C) 40 % 20 min / 13 min no limit no limit / 50 min no limit

RECEIVER	
Sensitivity	< -114 dBm (BER < 10 E-3) ***
Co-channel Rejection	> -12 dB
Adjacent Channel Selectivity	> 47 dB @ 12.5 kHz / > 52 dB @ 25 kHz
Intermodulation Attenuation	> 60 dB
Spurious Radiation	< 2 nW

DATA MODEM	
Interface	RS-232
Interface Connector	Waterproof IP67, 8-pin ODU
Data Speed of RS Interface	300 – 38400 bps
Data Speed of Radio Interface	19200 bps (25 kHz)
	9600 bps (12.5 / 20 kHz)
Data Format	Asynchronous RS-232

GENERAL	
Operating Voltage ****	+9 ... +16 Vdc
Operating voltage feeding	4-pin ODU MINI-Snap Size 1
Power Consumption (average)	1.8 W typical (Receive)
	120 W typical (Transmit 35W output power) 100 W typical (Transmit 25W output power)
	0.4 W typical (Sleep State)
Temperature Range - Operating	-25 °C … +55 °C
	-40 °C … +75 °C (absolute minimum / maximum)
- Storage	-40 °C … +85 °C
Antenna Connector	TNC, 50 ohm, female
Construction	Aluminium Enclosure
Size H x W x D	189 x 138 x 71 mm (with connectors)
Weight	1420 g
IP Classification	IP67 (NEMA 6)

Values are subject to change without notice.
* Limited output power is available as on order option.
** If high output power is used continuously or with a high duty cycle, the equipment generates excess heat. The output power is automatically decreased when necessary to prevent overheating. Typical operating times are shown in the chart with different output powers and duty cycles @ 22°C and 35°C.
*** Depends on receiver settings.
**** ≥ +12 Vdc @ 35 W output power

Distributor:

SATELLINE-EASy

SATELLINE-EASy is a state-of-the-art transceiver radio modem providing a compact and flexible solution for many different long range applications. It can be equipped with an LCD and push buttons for facilitating the configuration of the radio modem.

Setting up a local data transfer network is quick and cost effective with SATEL radio modems. The wireless network is independent and free of operator services. The cost of operation is either free of charge or fixed, depending on the frequency used. SATEL radio modems are type-approved in over 50 countries.

SATEL radio modems are always on line and provide reliable, real-time data communications over distances ranging from tens or hundreds of metres up to around 80 kilometres. Thanks to a store and forward function, any radio modem in a network can be used as a master station, substation and / or re-peater.

SATEL radio modem networks are flexible, easy to expand and can cover a wide variety of solutions from simple point-to-point connections to large net-works comprising hundreds of modems. Even for ex-panded networks, only one operating frequency is required.

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info@satel.com

SATEL

Mission-Critical Connectivity

SATELLINE-EASy

- SATELLINE-EASy has two operating voltage levels to choose and low power consumption.
- The channel spacings 12.5, 20 and 25 kHz are software-selectable and the output power of 1W enables long connection distances.
- It has a wide 90 MHz / 70 MHz tuning range and the operation frequency can be selected within the ranges 330...420 MHz and 403...473 MHz.
- SATELLINE-EASy complies with the EN 300 113, EN 301 489-1, -5, EN 60950-1 and FCC Part 90 specifications.
- SATELLINE-EASy is also available as an IP67 product with 35W output power. You can find more information about the product in the SATELLINE-EASy Pro.

SATELLINE-EASy 869

- SATELLINE-EASy 869 is ready to use on the Pan-European licence free channels with default settings. It is allocated for narrowband telemetry, alarm and data transfer applications.
- SATELLINE-EASy 869 complies the EN 300 220-1, -2, EN 301 489-1, -3 and EN 60950-1.

	SATELLINE-EASy	SATELLINE-EASy 869
Frequency	330...420 MHz / 403 ... 473 MHz	869.400 ... 869.650 MHz
Channel Width	12.5 kHz / 20 kHz / 25 kHz (Software selectable)	25 kHz
Tuning Range	90 MHz / 70 MHz	0.25 MHz
Adjacent Channel Power	< -60 dBc	< -64 dBc
Sensitivity BER < 10E-3 (FEC ON)	-114 dBm @ 12.5 kHz -111 dBm @ 25 kHz	-111 dBm
Adjacent Channel Selectivity (FEC ON)	>47 dB @ 12.5 kHz >52 dB @ 25 kHz	>52 dB
Data Speed of Radio Interface	19200 bps (25 kHz channel) 9600 bps (12.5 / 20 kHz channel)	19200 bps (25 kHz channel)
Power Consumption Save Modes	<1.2 W (Receive) <7 W (Transmit 1 W) Sleep: 0.12 W / DTR: 10 mW	<1.2 W (Receive) <3.8 W (Transmit 0.5 W) Sleep: 0.12 W / DTR: 10 mW
Modulation	4FSK, GMSK	4FSK
Operating Voltage	2 options: +3 ... +9 Vdc or +6 ... +30 Vdc	+6 ... +30 Vdc
Carrier Power	100, 200, 500, 1000 mW	10, 20, 50,100, 200, 500 mW
Frequency Error Tolerance	< 1 kHz	< 2.5 kHz
Spurious Emission	< -100 dBm (RX), < -80 dBm on 3rd harmonics @ 1215 - 1240 MHz (TX)	< -57dBm (RX/TX)

GENERAL	
Blocking (FEC ON)	>86 dB
Selectivity at ±50 kHz	>67 dB
Type of Emission	F1D
Communication Mode	Half-Duplex
Carrier Power Stability	<± 1.5 dB
Spurious Radiation	< 2 nW
Intermodulation Attenuation	>60 dB
Electrical Interface	Port1 fixed: RS-232 Port2 options: LVTTL, TTL or RS-232 / 422 (Port2 RS-232 / 422 is programmable)
Interface Connector	D15, female
Data Speed of Serial Interface	300 – 38400 bps
Data format	Asynchronous data
Temperature range	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute minimum / maximum) -40 °C … +85 °C (storage)
Antenna Connector	TNC, 50 ohm, female
Construction	Aluminium housing
Size H x W x D / Weight	139 x 67 x 29 mm / 250 g

Values are subject to change without notice.

SATELLINE-EASy radio modems are also available as radio modules (Size: 88 x 49 x 9 mm / 50 g). You can find more information about SATELLINE-M3-TR1 and SATELLINE-M3-TR1 869 in the module brochure.

SATEL

Mission-Critical Connectivity

www.satel.com

Ranger™ 3 Data Collector

SPECTRA PRECISION®

Rugged and Full Featured

Features

- **Large, bright, sunlight-readable color VGA screen**
- **Meets MIL-STD-810G standards**
- **IP67 rating**
- **SDHC card slot and USB connections**
- **30+ hour rechargeable battery**
- **Windows Mobile 6**
- **Integrated Bluetooth, Wi-Fi, compass and GPS**

Spectra Precision Ranger 3 Data Collector

The third generation Spectra Precision® Ranger™ Data Collector offers a large, bright touch-screen, full alpha-numeric, easy to operate keypad, and is packed with the features surveyors depend on. Built rugged, it meets rigorous MIL-STD-810G military standard for drops, vibration, humidity and extreme temperatures, and with an IP67 rating, it's designed to keep your investment and your data safe. The Ranger 3 comes standard with 8 GB of onboard memory for storing data. Move your data fast and easily using a SDHC card, Bluetooth, USB cable, USB memory stick, Wi-Fi, or WWAN modem.

- Optional 2.4GHz built-in radio provides real-time communications with your Spectra Precision FOCUS 35 robotic total station.
- Large 4.2 inch high resolution, field rugged touch screen that is designed for use outdoors in all light and weather conditions.
- Optional WWAN modem for network RTK and data connectivity. Connect to Spectra Precision Central for productive data synchronization and coordination.
- Full alphanumeric keyboard with direction keys and multiple Enter keys make for easy use and fast data entry, even when wearing gloves.
- Comes with Spectra Precision Survey Pro or Layout Pro field software for survey and construction professionals.

Ranger™ 3 Data Collector

Technical Specifications

Standard Software

Windows Mobile® 6.5 Professional operating system, including:

- Microsoft Office Mobile:
  - Word Mobile
  - Excel Mobile
  - PowerPoint Mobile
  - Outlook Mobile
- Internet Explorer Mobile
- SMS Text Messaging Support
- Notes / Tasks
- Task Manager
- Adobe Acrobat Reader
- Customized Camera and Flash control including geo-tagging through Microsoft Pictures & Videos software*
- Operating system language options (customer provisionable): Simplified Chinese, English, French, German, Japanese, Spanish

- Calculator
- Microsoft Pictures and Videos
- Flashlight mode control application
- Calendar / Contacts
- Windows Media Player
- Messenger
- SatViewer (GPS interface software application)

Spectra Precision Field Software

- Survey Pro
- Layout Pro
- FAST Survey

Standard Accessories (included)

- 28.9 Wh Li-Ion battery
- International AC power supply
- USB cable (mini)
- Stylus with spring tip (pkg of 2)
- Radio antenna for integrated 2.4 GHz radio modem*

- Screen protectors
- Audio port dust cover
- I/O port dust covers
- Standard soft case
- Hand strap
- Stylus tether

Hardware

Physical Specifications

Size. . . . . .141 mm x 278 mm x 64 mm (5.6 in x 10.9 in x 2.5 in) 80 mm (3.2 in) at handgrip

Weight . . . . 1.04 kg (2.3 lb) including rechargeable battery 1.10 kg (2.4 lb) including rechargeable battery and internal 2.4 GHz radio-modem*

Housing . . . . Polycarbonate (case), Hytrel® (overmold)

Environmental Specifications

Meets or exceeds:

Operating Temperature . . . . . . –30 °C to 60 °C (–22 °F to 140 °F)

Storage Temperature . . . . –40 °C to 70 °C (–40 °F to 158 °F)

Temperature shock . . . MIL-STD-810G, Method 503.5, Procedure I

Humidity . . . 90% RH temp cycle –20 °C/60 °C (–4 °F/140 °F) MIL-STD-810G, Method 507.5

Sand & dust. . . . IP6x: 8 hours of operation with blowing talcum powder (IEC-529)

Water. . . . . .IPx7: Immersed in 1 m of water for 30 minutes (IEC-529)

Drop . . . . . . .26 drops at room temperature from 1.22 m (4 ft) onto plywood over concrete MIL-STD-810G, Method 516.6, Procedure IV

Vibration . . . . . . .General Minimum Integrity and Loose Cargo test MIL-STD 810G, Method 514.6, Procedures I, II

Altitude . . . . 4,572 m (15,000 ft) at 23 °C (73 °F) and 12,192m (40,000 ft.) at –30 °C (–22 °F) MIL-STD-810G, Method 500.5, Procedures I, II, III

Electrical Specifications

Processor . .Texas Instrument Sitara™ 3715 series ARM® Cortex™–A8 Processor (800 MHz)

Memory. . . . . 256 MB RAM

Storage . . 8 GB non-volatile NAND Flash onboard

Expansion . . . . . . .SDHC memory slot, USB host

Batteries . . . . 11.1 V, 2600 mAh, 28.9 Wh Li-Ion rechargeable pack Battery life of 30+ hours under normal operating conditions[1]. Full charge in 3.0 hours.

Notification LEDs . . 3 x tri-colored notification LEDs

Display. .107 mm (4.2 in) landscape VGA display, 640 x 480 pixels sunlight-readable color TFT with LED backlight, resistive touchscreen

Keyboard . . . . "ABCD" style keypad with 10-key number pad, directional buttons, and 4 programmable buttons

Audio. . . . . Integrated speaker and microphone with 3.5 mm stereo headset/microphone port

I/O . . . . .USB Host, USB Client DC power port, 9-pin serial RS-232

Wireless. . . . . . .integrated Bluetooth 2.0 +EDR, integrated Wi-Fi 802.11 b/g integrated quad-band GSM/GPRS/EDGE: 850/900/1800/1900 MHz, 2/6 Mbit/s 3G HSDPA GSM, Dual band CDMA2000 in Bands BC0 and BC1 (800/900MHz), WWAN* integrated 2.4 GHz frequency-hopping spread-spectrum radio modem*

Camera*/GPS/Compass/ Accelerometer . . . . . . .5 MP auto focus camera with dual white light LED flash, LED flashlight function; integrated GPS (WAAS enabled); integrated compass; integrated accelerometer

Certifications

Class B Part 15 FCC certification, CE Mark approval and C-tick approval. RoHS compliant. Bluetooth type approvals and regulations are country specific.

MIL-STD-810G, IP67, MIL-STD-461, PTCRB, GCF compliant, Wi-Fi Alliance certified.

Country type certifications: USA, Canada, EU, New Zealand, Australia.

Pending certifications: Brazil, China (PRC), India, Japan, Republic of Korea, Russia, Taiwan, Thailand, UAE

Recycling Information

For product recycling instructions and more information, please go to: www.spectraprecision.com/ev.shtml.

1 Unit is idle with backlight turned on, no radios turned on, moderate temperatures.

* Only available on select models

Nomad 1050

SPECTRA PRECISION

Rugged Handheld Computer

Spectra Precision Nomad 1050

A Complete Package

The Spectra Precision Nomad® 1050 rugged handheld computer's many built-in capabilities make it an optimized and easy to use field data collector. It provides all the features you need, including: a 5200mAh lithium-ion battery with more than 15 hours of continuous use, 8 GB storage, and a high-resolution, sunlight-readable VGA color display to show images, maps and data in crisp detail. And all of that on an IP68 rated, fully rugged device. It's built to work hard all day long, just like you do.

For communications, Nomad 1050 offers a full range of integrated wireless capabilities including Bluetooth®, WiFi 802.11 b/g and an optional 3.75G dual-band GSM/CDMA modem for internet connectivity wherever you happen to be. Integrated expansion via SD card slots also provide an easy method of data sharing. The basics are also there including RS232 serial connections and USB.

The Nomad 1050 boasts an advanced Global Navigation Satellite System (GNSS) antenna design which reads the full constellation of satellite signals plus SBAS – it's a perfect complement to the Survey Pro GeoLock feature for robotic target location. The 5 megapixel camera captures high resolution images to document your work. Photographs can be geotagged for use in various applications.

The backlit numeric keypad makes data entry easier, especially when wearing gloves and a range of accessories including tripod and pole brackets make the Nomad 1050 a full-featured product that will work for you. The 1.0 GHz processor has the power you need for advanced application work, with the Nomad's optimized graphics processing, advanced caching, and proprietary high-speed journaling system.

Nomad – it is technology made to work for you.

Features

- **IP68 rated rugged for any environment**
- **15 hour battery life**
- **Numeric, backlit keypad**
- **Integrated 2-4 meter GPS**
- **3.75G dual-band GSM/CDMA modem**
- **5 MP camera with flash and geotagging**
- **Integrated Bluetooth® and Wi-Fi**
- **Full-color VGA display**
- **1.0 GHz processor**
- **Microsoft® Windows® Embedded Handheld (WEHH) 6.5**

Nomad 1050

Technical Specifications
- Microsoft® Windows® Embedded Handheld (WEHH) 6.5 Professional, available in English, Spanish, French, German, Italian, Japanese, Korean, Portuguese (Brazilian), Russian, or Chinese (Simplified)
- Processor: 1 GHz, Texas Instruments™ DM3730
- 512 MB DDR SDRAM
- 8 GB non-volatile Flash storage
- Full VGA sunlight-readable color TFT display
- Resistive Touchscreen
- Rugged submersible design (prolonged immersion in water at 1 meter depth)
- IP68 and MIL-STD-810G
- Integrated speaker and microphone
- Bluetooth® 2.0 + EDR
- SDIO/SDHC or a micro SD/SDHC slot
- Notification LEDs
- USB client and optional host
- Headset jack (2.5 mm mono audio and microphone)
- 15-hour battery life (in active use with default settings)
- Keypad with backlight
- 12-month limited warranty

Spectra Precision Field Software
- Survey Pro
- Layout Pro

Configuration Options
- Integrated Dual-Mode 3.75G GSM / CDMA capability
- Integrated GPS (SiRFstar IV, WAAS / SBAS capable)
- Integrated Wi-Fi b/g
- USB Host slot
- Integrated digital camera (color, 5 megapixel resolution, with flash)

Standard Software
- Microsoft Office Mobile
  - Word Mobile
  - Excel Mobile
  - PowerPoint Mobile
  - Outlook Mobile
  - Pocket OneNote
- Online help
- Internet Explorer Mobile
- Notes/Tasks
- Calculator
- Windows Media Player
- Microsoft Pictures and Videos
- Contacts/Calendar
- Microsoft ActiveSync®

Standard Accessories
- Rechargeable Li-ion battery module
- Orientation Guide
- Rugged stylus with spring-loaded tip
- Hand strap
- Stylus lanyard
- Screen protectors
- Carry case
- AC charger and international adapters
- USB data cable
- Serial boot
- Standard Cap

Physical Characteristics
Size
- 17.6 cm x 10 cm x 5.0 cm (6.92 in x 3.92 in x 1.96 in)

Weight
- 596 g (21 ounces) including rechargeable battery

Housing
- Polycarbonate

Color
- Dark Gray w/ Black

Environmental Characteristics
Meets or exceeds:
Water
- Survives IP-X8 , immersion at 2m (6.6 ft) for 1 hour IEC-60529, Survives IP-X6, water jet 12.5mm dia @ 2.5-3m (8-10ft)

Dust
- Protected against dust, IEC-60529 IP-6X, dust chamber under-pressure

Drops
- Survives multiple drops of 1.2m(4ft), MIL-STD-810G, Method 516.6, Procedure IV, Transit Drop

Operating Temperature
- -30 °C to 60 °C (-22 °F to 140 °F), MIL-STD-810G, Method 502.5, Procedure I, II, III (Low Temp Operating -30 °C); Method 501.5, Procedure I & II (High Temp Operating 60 °C)

Storage Temperature
- -40 °C to 70 °C (-40 °F to 158 °F), MIL-STD-810G, Method 502.5, Procedure I, II, III (Low Temp Storage -40 °C); Method 501.5, Procedure I & II (High Temp Storage 70 °C)

Temperature Shock
- Cycles between -30 °C and 60 °C (-22 °F and 144 °F), MIL-STD-810G, Method 503.5, Procedure I-C

Humidity
- 90% relative humidity with temperatures between -30 °C and 60 °C (-22 °F and 144 °F), MIL-STD- 810G, Method 507.5, Procedure II

Altitude
- 4,572 m (15,000 ft) at 23 °C (73 °F) to 12,192 m (40,000 ft) at -30 °C (-22 °F), MIL-STD-810G, Method 500.5, Procedure I, II & III

Vibration
- General minimum integrity and loose cargo tests, MIL-STD-810G, Method 514.6, Procedure I & II, Category 5

Solar Exposure
- Survives prolonged UVB exposure, MIL-STD-810G, Method 505.5, Procedure II

Chemical Exposure
- Resistant to mild alkaline and acid cleaning solutions, fuel hydrocarbons, alcohols and common vehicle and factory machine lubricants

Electrical
Processor
- 1.0 GHz, Texas Instruments DM3730

Memory
- 512 MB DDR SDRAM; ~10 MB reserved

Storage
- 8 GB onboard non-volatile NAND Flash; ~50 MB reserved

Expansion
- 1x Micro SD/SDHC slot (XC model) 1x USB Host and SDIO slot (B and L models)

Display
- 3.5", 480 x 640 pixel (full VGA) 16-bit color TFT with LED backlight

Batteries
- 5200 mAh Li-ion rechargeable module[1]

I/O
- USB host and client, power, headset jack

GPS Accuracy
- 2–4 m (6-13 feet) SBAS corrected[2]

Radios
- Bluetooth 2.0 + EDR; WLAN: Wi-Fi (802.11b/g);WWAN: Dual Mode 3.75G GSM/CDMA

Certifications
- FCC, CE, R&TTE, IC (Canada), A-tick, C-tick, GCF compliant, RoHS compliant, Section 508 compliant, PTCRB, SAR, AT&T network certified, Verizon, Wi-Fi Alliance certified, MIL-STD-810G, IP68

Specification subject to change without notice.

(1) To ensure best performance when temperatures are below –4 °F (–20 °C), be sure battery is inserted in the device only when in use. When device is not in use at these temperatures, keep batteries in a pocket or stored in a warmer area.

(2) 2–4 m (50%–95%) accuracy determined using Horizontal Root Mean Squared method – Open Sky.

Nomad 1050 Model Configurations

	RAM/ Flash	SDIO	USB Host	Micro SDHC	Bluetooth	WiFi	GPS	WWAN	Camera
1050 B	512 MB / 8GB	◉	◉		◉				
1050 L		◉	◉		◉	◉	◉		
1050 XC				◉	◉	◉	◉	◉	◉

LEICA Geo Office Software

The perfect partner for GPS1200 and TPS1200

Exploit the full potential of your data with LEICA Geo Office.

View and manage your TPS, GPS and Level data in an integrated way.

Process independently or combine your data.

LEICA Geo Office ensures you get the best result.
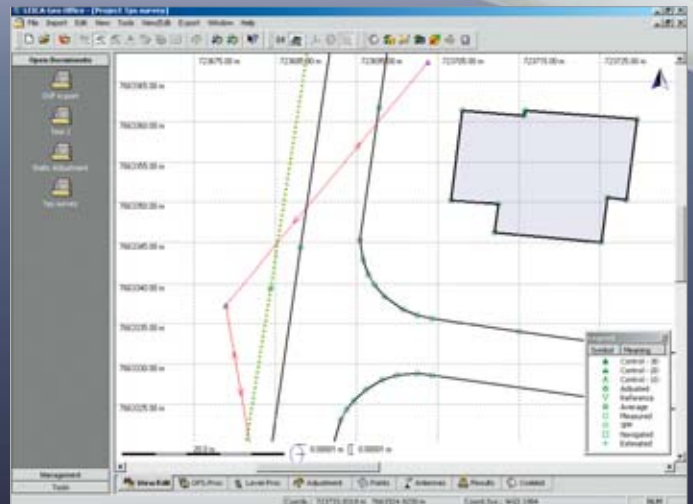
■ Easy and efficient to use

LEICA Geo Office is based on an intuitive, graphical interface within a Windows™ multitasking environment making it very easy to learn and use. All components have a similar look and feel and interact seamlessly with each other.

GPS, TPS and level data are handled in a similar way with standardized tools and dataflow. The embedded HELP contains useful tutorials and provides advice and information whenever needed. LEICA Geo Office assists you at every step.

■ Data management

The different management components for projects, coordinate systems, GPS antennas, report templates etc. provide a very logical separation of important information and a clear overview of all data. They enable you to manage your data and work easily and efficiently in a consistent manner.

■ View and edit

Various graphical and numerical displays allow you to view the data. Point, line, area, coordinate, code and attribute information can all be accessed and inspected in detail. Editing functions allow you to make any changes, corrections, additions or deletions that may be necessary before processing or exporting the data. With the view and edit facility, you can make sure that your work is correct.

Easy to customize

Choose the way you want to work. Configure and set the software for your preferences and requirements. Set panels and screens to display the information that you need and in the formats you prefer. Define import and export masks for the way you have to handle data. LEICA Geo Office can be customized easily and quickly.

Tools for GPS, TPS and levels

Codelist Manager, Data Exchange Manager, Format Manager and Software Upload are common tools for GPS receivers, total stations and also for digital levels. Powerful, easy-to-use, user-definable and wizard-guided, these software tools have all the functionality needed to exploit the full potential of the instruments and their data.

WORKING TOGETHER

X FUNCTION integrated

LEICA SYSTEM 1200
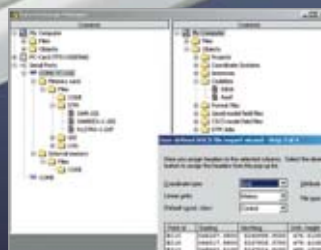
Quality control

LEICA Geo Office provides numerous quality checks. View a plan of your work and inspect the data on the screen to check for completeness. Compute and check loop misclosures. Coordinates of points measured more than once are averaged automatically provided that they lie within user-defined tolerances.

Flexible reporting

HTML-based reporting provides the basis for generating modern, professional reports. Measurement logs in field book format, reports on averaged coordinates, various processing log files and other information can be prepared and saved. Configure reports to contain the information that you require and define templates to determine the presentation style. LEICA Geo Office has full reporting facilities.

Flexible import and export

Import data from Compact-Flash cards, directly from receivers, total stations and digital levels, or from reference stations and other sources via the Internet. Import coordinate lists as user-defined ASCII files using the import wizard. Export results in any format to any software using the ASCII export function. Transfer point, line, area, coordinate, code and attribute data to GIS, CAD and mapping systems. LEICA Geo Office has all the flexibility required for the easy import and export of data.

GNSS Solutions™

The Solution for all GNSS Survey Data

Features:

- **Comprehensive software package**

- **Process GPS, GLONASS and SBAS survey data**

- **Intuitive user interface**

A Single Program For All Applications

GNSS Solutions™ software is the indispensable tool for all surveyors who need to efficiently and smoothly conduct their GNSS surveys. GNSS Solutions post processing gives optimal results from any combination of static, rapid static or kinematic data. The software supports a wide range of surveying applications, handling both real-time and post-processing data within the same project thus opening new horizons to surveyors.

Intuitive Handling Of Graphical Data

GNSS Solutions software is organized around a powerful database which holds all the data created or collected at different stages during user projects. Map design, survey and time views enable an optimium overview of large projects. Any collection of data can be viewed in different forms through simple drag and drop operations. The documents created include tables, maps or graphs and are all attached to the project. Compatibility with the OpenGIS standard format allows easy data flow to numerous GIS software packages. Importing raster or vector map formats allows surveyors to open background projects and combine them with land survey projects.

Easily Adaptable To Local Requirements

GNSS Solutions is available in six languages enabling the user to install the language of their choice. Numerous mapping projections and local coordinate transformations are available, allowing users to easily modify them according to their own needs. Users may create individual report files in order to comply with national standards.
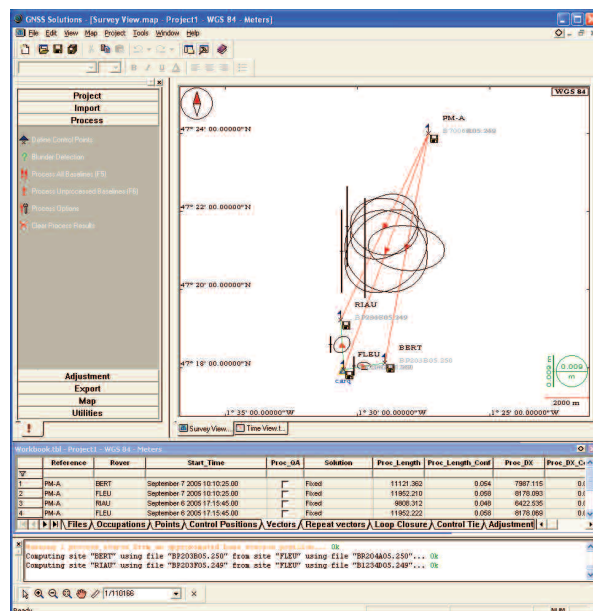
GNSS Solutions Technical Specifications

Applications

- Topography
- Geodesy
- Construction
- GIS surveys

Main functions

Real-time survey

- Interactive communication with handheld survey controller
- Coordinate transformation using a large set of predefined coordinate systems
- Display and analysis of survey results
- Capability to import vector/raster images as background maps
- Data export (ASCII user defined, NMEA, CR5, CRD, DXF)
- Report generation (RTF documents)

Post-processing survey L1 & L1/L2 GPS/Glonass/SBAS

- Automatic project control with optimized default settings
- Modes: Static, Rapid Static, Stop&Go Kinematic, Continuous Kinematic
- Occupations tab (Files vs. Time)
- Raw data plots
- Configurable quality assurance test
- Precise orbits, clocks, ionospheric grids
- Long baselines (up to 1000 km)
- VRS

Feature code processing

- Processing, editing and attributing of any point, line or area feature
- Easy conversion to CAD programs using dxf layers

Data views

- Survey
- Time
- Table
- All views can be combined

Network adjustment

- Blunder detection including Chi-Square and Tau tests
- Display of precision results in graphical form
- Testing network adjustment using control points

Mission Planning Utility

- Importing and viewing sets of almanacs
- Prediction point easily defined using the graphical world map editor
- Numerous viewing options (schedule, range, doppler, elevation, azimuth, DOP)

Receiver Commands Utility

- Enabling communications with a GPS receiver
- Sending commands to a GPS receiver
- Programmable GPS recorder

Project Management Utility

- Back up projects
- Restore projects
- Delete projects
- Change project folder

Datum Transformation and Map Projection Utility

- Support of all major world projections
- Support of numerous national transformations
- Support of user coordinate calibration
- Intuitive loading of projection files into project and handheld controller

Geoids Utility

- Selecting a geoid from a list of models
- Extracting regions from a geoid model
- Importing new geoid models
- Uploading a geoid model into a receiver

Rinex Converter Utility

- Rinex to Ashtech (for ProMark 3)
- Rinex to ATOM (for ProMark 500/ProFlex 500)
- Ashtech to ATOM
- OPUS compliant

Internet Download

- RINEX data
- Automatic connection to an internet page with user-definable address
- Automatic RINEX extraction and import by date and time
- Merging of two or more RINEX files
- Precise clocks
- Precise ionospheric grids
- Precise ephemeris

System requirements

- Pentium® 233 MHz min, 300 MHz recommended
- Operating System: Windows® 2000 / XP / Vista
- RAM: 64 MB min, 128 MB recommended
- Recommended space on hard disk: 300 MB

Languages Supported

- English
- French
- German
- Portuguese
- Russian
- Spanish
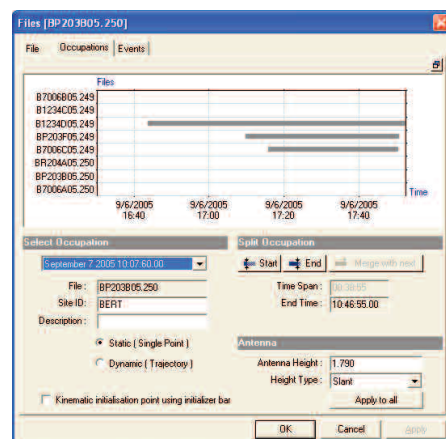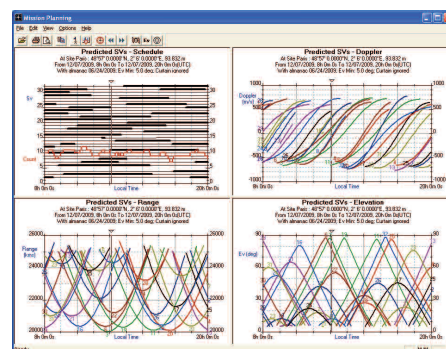
ashtech
BY MAGELLAN PROFESSIONAL

LEICA NA2 · NAK2

Leica

Universal automatic level

Leica
Geosystems

LEICA NA2 · NAK2
Proven reliability ensures precise results

Versatile accessories for demonstrable success

A comprehensive program of accessories enables you to expand the performance and applications range of each instrument. This way, you can match your equipment exactly to requirements.

The possibilities are described in brochure "Survey accessories" 710 883en.

Robust container for safe transport

The NA2 is supplied in a foam-padded container made of high performance synthetic material. The foam padding absorbs all jolts and shocks. The container provides perfect protection for the NA2.

Technical data

Standard deviation for 1 km double-run levelling, depending on type of staff and on procedure	up to 0.7 mm
With parallel-plate micrometer	0.3 mm
Telescope	erect image
Standard eyepiece	32×
FOK73 eyepiece (optional)	40×
FOK117 (optional)	25×
Clear objective aperture	45 mm
Field of view at 100 m	2.2 m
Shortest focusing distance	1.6 m
Multiplication factor	100
Additive constant	0
Working range of compensator	~30'
Setting accuracy of compensator (stand. dev.)	0.3"
Sensitivity of circular level	8'/2 mm
Glass circle (K version)	400 gon (360°)
Graduation diameter	70 mm
Graduation interval	1 gon (1°)
Reading by estimation to	10 mgon (1')
Water- and dust resistance	IP53
Temperature range:	
Operation	–20°C to +50°C (– 4°F to 122°F)
Storage	–40°C to +70°C (–40°F to 158°F)

Parallel-plate micrometer (optional accessory)	Range	Interval	Estimation
GPM3, with glass scale	10 mm	0.1 mm	0.01 mm
GPM6, with metal drum	10 mm	0.2 mm	0.05 mm

TQM
ISO 9001 / ISO 14001

***Total Quality Management –
Our commitment to total
customer satisfaction***

Ask your local Leica Geosystems agent for more information about our TQM program.

Leica
Geosystems

*Leica Geosystems AG
CH-9435 Heerbrugg
(Switzerland)
Phone +41 71 727 31 31
Fax +41 71 727 46 73
www.leica-geosystems.com*

FlexLine plus

Leica FlexLine TS09plus
Full Precision at
High Performance

plus

- when it has to be **right**

Leica
Geosystems

The First Plus:
Original Leica Geosystems Quality

For most, "quality" is relative. Not so at Leica Geosystems. To ensure our instruments meet the highest precision and quality requirements, we manufacture them in state-of-the-art facilities around the world. Swiss technology combines with exceptional craftsmanship to provide best-in-class devices. And this quality also applies to all of our procedures – moving Leica Geosystems towards business excellence to meet our customers' needs and expectations in every way. The Leica FlexLine TS09plus Manual Total Station is ideal for mid- to high-accuracy applications. The brilliant color display with touch operation, built-in Bluetooth®, USB host and device board offer the highest performance and ease of use.

Welcome to the world of Leica Geosystems. Welcome to a world of people, technologies, services and devices that you can completely rely on.

ACTIVE customer care

my world @Leica Geosystems

The Third Plus: Full Precision, Superior Convenience and Performance

Electronic Distance Measurement:
Wherever high-distance measurement accuracy is required, you can face the challenge of this demanding task with the TS09plus. It provides the most accurate Electronic Distance Measurement.

Prism Mode
- Precision+ (1.5 mm + 2 ppm)
- Speed (1 second)

Non-Prism Mode
- Precision (2 mm + 2 ppm)
- PinPoint EDM with coaxial, small laser pointer and measurement beam for accurate aiming and measuring
- Fewer set-ups required, because targets on which it is not possible to set up a reflector can be measured using reflectorless measurement up to 1,000

Work productively with the new Leica FlexField plus on-board software and the new color & touch display.
The new Leica FlexField plus software is without a doubt a highlight of the FlexLine plus. Its advantages are immediately apparent with the extra large, built-in color & touch display.

- Low learning curve due to guided workflows
- Easy to understand graphics and icons
- Icons to quickly verify instrument status
- Fast navigation inside the software via touch screen, tabs and icons
- High resolution color display to show all information without misinterpretation
- Larger font size for fast and clear readability
- Fast operation through graphic guidance

The Leica FlexLine TS09plus Communication Side Cover enables cable-free connection to any data collector via Bluetooth®, for example the field-controllers Leica Viva CS10 or Leica Viva CS15 with SmartWorks Viva software. The USB-stick enables the flexible transfer of such data as GSI, DXF, ASCII, LandXML and CSV.

FlexField plus Onboard Software: Easy to use due to it's graphical guidance and intuitive workflows.
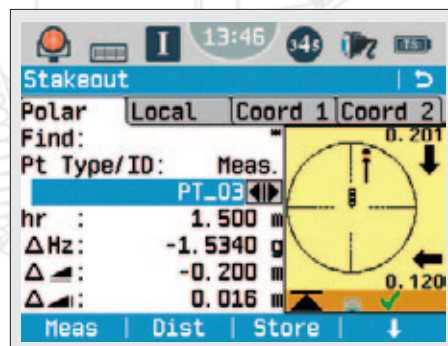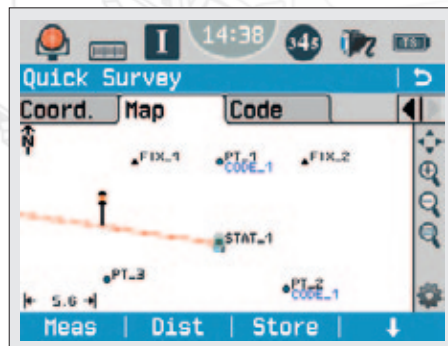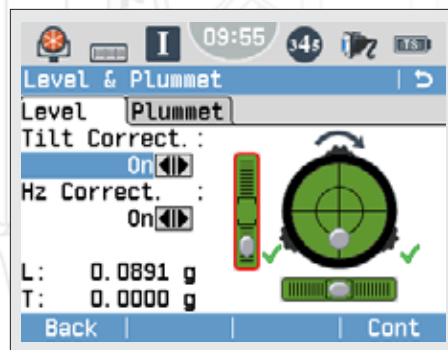
Leica Geosystems – mySecurity
mySecurity gives you total peace of mind. If your instrument is ever stolen, a locking mechanism is available to ensure that the device is disabled and can no longer be used.

Leica FlexLine Plus
Proven Specifications, Reliable Instruments

Leica FlexLine TS09plus specifications:

Angle Measurement (Hz, V)		
Accuracy [1]	1" (0.3 mgon) / 2" (0.6 mgon) 3" (1 mgon) / 5" (1.5 mgon)	✔
Method	Absolute, continuous, diametrical: at all models	✔
Display resolution	0.1" / 0.1 mgon / 0.01 mil	✔
Compensation	Quadruple Axis Compensation: at all models	✔
Compensator Setting Accuracy	0.5" / 0.5" / 1" / 1.5"	✔

Distance Measurement with Reflector		
Range [2] Round prism (Leica GPR1)	3.500 m	✔
Range [2] Prism-Long (Leica GPR1, R500/R1000)	>10.000 m	✔
Range [2] Reflective tape (60 mm x 60 mm)	>500m [9] >1000m [10]	✔
Accuracy [3]	Precise+: 1.5 mm + 2.0 ppm Precise Fast: 2.0 mm + 2.0 ppm Tracking: 3.0 mm + 2.0 ppm	✔
Typical Measurement time [4]	1.0 s	✔

Distance Measurement without Reflector [8]		
Range [5] PinPoint R500 / R1000	> 500 m / > 1000 m	✔O
Accuracy [3][6]	2 mm + 2 ppm	✔
Laser dot size	At 30 m: approx. 7 x 10 mm At 50 m: approx. 8 x 20 mm	✔

Data storage / Communication		
Internal memory	Max.: 100'000 fixpoints, Max.: 60'000 measurements	✔
Interfaces	- Serial (Baudrate up to 115'200) - USB Type A and mini B, - Bluetooth® Wireless, class 1, 150 m - > 1000 m (with TCPS29)	✔ ✔ ✔ O
Data formats	GSI / DXF / LandXML / CSV / user definable ASCII formats	✔

Guide Light (EGL)		
Working Range (average atmospheric conditions)	5 m – 150 m	✔
Positioning accuracy	5 cm at 100 m	✔

Telescope		
Magnification	30 x	✔
Resolving power	3"	✔
Field of View	1° 30' (1.66 gon) 2.7 m at 100 m	✔
Focusing range	1.7 m to infinity	✔
Reticle	Illuminated, 10 brightness levels	✔

Keyboard and Display		
Keyboard and Display	Full Alpha-numerical keyboard with Color & Touch display, Graphics, Q-VGA, key- and display illumination, 5 brightness levels	✔
Position	Face I, Face II	✔O

Operating System		
Windows CE	5.0 Core	✔

Laserplummet		
Type	Laser point, 5 brightness levels	✔
Centering accuracy	1.5 mm at 1.5 m Instrument height	✔

Battery		
Type	Lithium-Ion	✔
Operating time [7]	approx. 30 hours	✔

Weight		
Total station including GEB211 and tribrach	5.1 kg	✔

Environmental		
Temperature range (operation)	–20° C to +50° C (–4° F to +122° F)	✔
	Arctic Version –35° C to 50° C (–31° F to +122° F)	O
Dust / Water (IEC 60529) Humidity	IP55, 95%, non condensing	✔

Leica FlexField plus Onboard Sofware	
Included Application Programs: Survey incl. Map View; Selection from map within applications; Stake Out; Station Setup including: Resection, Local Resection, Helmert Resection, Orientation (Angles & Coordinates), Height Transfer; Area (Plan & Surface); DTM Volume calculation; Tie Distance (MLM); Remote Height; Hidden Point; Backsight Check; Offset; Reference Line; Reference Arc; Reference Plane; Road 2D; COGO; Road 3D; Traverse	✔

Theft protection		
mySecurity, PIN/PUK Code		✔✔

Model Comparison: Configurations & Options of Manual Total Stations

	TS02plus	TS06plus	TS09plus	Viva TS11
1" angular accuracy	–	O	O	O
Enhanced measurement accuracy to prism	1.5 mm + 2 ppm	1.5 mm + 2 ppm	1.5 mm + 2 ppm	1.0 mm + 1.5 ppm
Reflectorless measurement range	500 m option	500 m included/1000 m option	500 m included/1000 m option	500 m included/1000 m option
Display with graphics and display illumination	Black & White high resolution	Black & White high resolution	Q-VGA Color & Touch	Full-VGA Color & Touch
Full alpha-numerical keyboard with function keys	–	✔	✔	✔
Second Keyboard	O	O	O	O
Keyboard illumination	–	–	✔	✔
Electronic Guide Light	–	O	✔	✔
USB Type A and mini B	–	✔	✔	✔
Bluetooth® Wireless	–	✔	✔	✔
SD Card	–	–	–	✔
Imaging capability	–	–	–	O
Smart Station GNSS capability	–	–	–	O
Onboard software (package content)	FlexField plus (standard)	FlexField plus (advanced)	FlexField plus (full)	SmartWorx Viva (pro)

Legend:
1) Standard deviation ISO-17123-3
2) Overcast, no haze, visibility about 40 km; no heat shimmer.
3) Standard deviation ISO-17123-4
4) Prism Precise Fast mode
5) Under optimal conditions on Kodak Grey Card (90% reflective). Maximum range varies with atmospheric conditions, target reflectivity and surface structure.
6) Range > 500m 4mm+2ppm
7) Single Measurement every 30 second at 25° C. Battery time may be shorter if battery is not new. Internal battery GEB222.
8) Reflectorless measurement time may vary according to measuring objects, observation situations and environmental conditions.
9) with R500 option using Non-prism mode
10) with R1000 option using Non-prism mode

✔ Included
O Option
– Not available

The Second Plus:
Real Features, True Benefits

USB Stick
- For fast and easy transfer of data

Wireless Bluetooth®
- For cable-free connection to data logger

Electronic Guide Light
- For faster stake-out

FlexField plus
- Modern and intuitive on-board software for higher productivity

Arctic version
- For use at −35°C (−31°F)

PinPoint EDM
- The most precise in its class (1.5 mm + 2 ppm)
- Extremely fast (1 second)
- › 1.000 meters without prism
- Coaxial laser pointer and measurement beam

Color & Touch Display
- Highest user-friendliness

Useful tools
- A range of tools, such as a trigger key and laser plummet, speed up your work

mySecurity
- Unique cloud-based protection against theft

Whether you want to survey a parcel of land or objects on a construction site, determine measured points on facades or in rooms, gather the coordinates of a bridge or a tunnel – Leica Geosystems' total stations provide the right solution for every application.
They unite reliable results with easy operation and user-friendly applications. Our total stations are designed to meet your specific requirements. Modern technology enables you to work fast and productively, thanks to the straightforward and clearly structured range of functions.

- when it has to be right.

Swiss Technology
by Leica Geosystems

TQM
ISO 9001 / ISO 14001

**Total Quality Management –
our commitment to total
customer satisfaction.**

Distance meter:
(PinPoint R500 / R1000):
Laser class 3R in accordance
with IEC 60825-1 resp.
EN 60825-1

Laser plummet:
Laser class 2 in accordance
with IEC 60825-1 resp.
EN 60825-1

Distance meter:
(Prism Mode)
Laser class 1 in accordance
with IEC 60825-1 resp.
EN 60825-1

Guide light (EGL):
LED class 1 in accordance
with IEC 60825-1 resp.
EN 60825-1

The **Bluetooth®** word mark and logos
are owned by Bluetooth SIG, Inc. and
any use of such marks by Leica
Geosystems AG is under license.

Other trademark and trade names are
those of their respective owners.

Cover picture: Shanghai Pudong Skyline
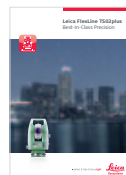
**FlexLine
TS02plus**
Brochure
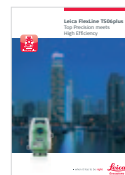
**FlexLine
TS06plus**
Brochure

**FlexField plus &
FlexOffice**
Brochure

Viva TS11
Brochure

**Original
Accessories**
Brochure

Please visit www.leica-geosystems.com
for detailed information about Leica FlexLine plus
and more documents.

Leica Geosystems AG
Heerbrugg, Switzerland

www.leica-geosystems.com

- when it has to be **right**

Leica
Geosystems

FlexLine plus

Leica FlexLine TS06plus
Top Precision meets
High Efficiency

plus

- when it has to be **right**

Leica
Geosystems

The First Plus:
Original Leica Geosystems Quality

For most, "quality" is relative. Not so at Leica Geosystems. To ensure our instruments meet the highest precision and quality requirements, we manufacture them in state-of-the-art facilities around the world. Swiss technology combines with exceptional craftsmanship to provide best-in-class devices. And this quality also applies to all of our procedures – moving Leica Geosystems towards business excellence to meet our customers' needs and expectations in every way. The Leica FlexLine TS06plus Manual Total Station is ideal for many daily surveying tasks, especially for mid- to high-accuracy applications. Banking on the heritage of the previous Leica TS06 model, the most successful of the Leica FlexLine Series, the Leica FlexLine TS06plus is the newest ultimate Total Station.

Welcome to the world of Leica Geosystems. Welcome to a world of people, technologies, services and devices, that you can completely rely on.

ACTIVE customer care

my world
@Leica Geosystems

The Third Plus:
Top Precision, Speed and Efficiency

The claim "easy to operate" seems to be everywhere. Whether this promise can be kept only becomes apparent in the practice. Because professional measurement experts were involved in its development, the Total Station Leica FlexLine TS06plus allows you to work quickly and effectively right from the first day.

Electronic Distance Measurement:
Wherever high-distance measurement accuracy is required, you can face the challenge of this demanding task with the TS06plus. It provides the most accurate Electronic Distance Measurement.

Prism Mode
- Precision+ (1.5 mm + 2 ppm)
- Speed (1 second)

Non-Prism Mode
- Precision (2 mm + 2 ppm)
- PinPoint EDM with coaxial, small laser pointer and measurement beam for accurate aiming and measuring
- Fewer set-ups required, because targets on which it is not possible to set up a reflector can be measured using reflectorless measurement up to 1.000

The Leica FlexLine TS06plus Communication Side Cover enables cable-free connection to any data collector via Bluetooth, for example the field-controllers Leica Viva CS10 or Leica Viva CS15 with SmartWorks Viva software. The USB-stick enables the flexible transfer of such data as GSI, DXF, ASCII, LandXML and CSV.

Built-in user friendliness: The full alpha-numerical keyboard.
The Leica TS06plus standard built-in alpha-numerical keyboard enables fast and easy entry of numbers, letters and special characters, e.g. for coding. It increases the work speed while at the same time reducing possible sources of error.

FlexField plus Onboard Software: Easy to use due to it's graphical guidance and intuitive workflows.
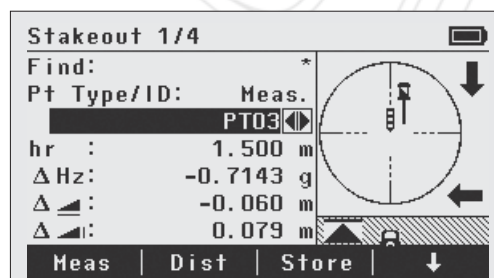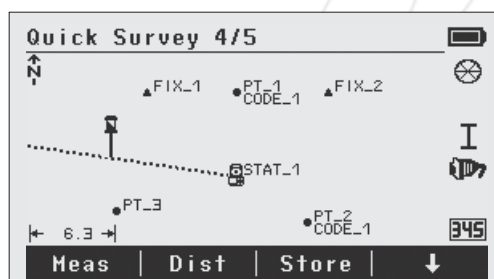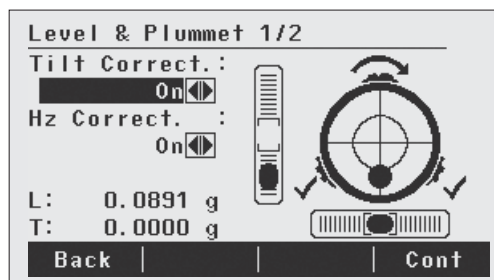
Leica Geosystems – mySecurity
mySecurity gives you total peace of mind. If your instrument is ever stolen, a locking mechanism is available to ensure that the device is disabled and can no longer be used.

Leica FlexLine Plus
Proven Specifications, Reliable Instruments

Leica FlexLine TS06plus specifications:

Angle Measurement (Hz, V)		
Accuracy [1]	1" (0.3 mgon) / 2" (0.6 mgon) 3" (1 mgon) / 5" (1.5 mgon) 7" (2 mgon)	✔
Method	Absolute, continuous, diametrical: at all models	✔
Display resolution	0.1" / 0.1 mgon / 0.01 mil	✔
Compensation	Quadruple Axis Compensation: at all models	✔
Compensator Setting Accuracy	0.5" / 0.5" / 1" / 1.5" / 2"	✔

Distance Measurement with Reflector		
Range [2] Round prism (Leica GPR1)	3.500 m	✔
Range [2] Reflective tape (60 mm x 60 mm)	>500 m [9] >1000 m [10]	✔
Range [2] Prism-Long (Leica GPR1, R500/R1000)	>10.000 m	✔
Accuracy [3]	Precise+: 1.5 mm + 2.0 ppm Precise Fast: 2.0 mm + 2.0 ppm Tracking: 3.0 mm + 2.0 ppm	✔
Typical Measurement time [4]	1.0 s	✔

Distance Measurement without Reflector [8]		
Range [5] PinPoint R500 / R1000	> 500 m / > 1000 m	✔O
Accuracy [3] [6]	2 mm + 2 ppm	✔
Laser dot size	At 30 m: approx. 7 x 10 mm At 50 m: approx. 8 x 20 mm	✔

Data storage / Communication		
Internal memory	Max.: 100'000 fixpoints, Max.: 60'000 measurements	✔
Interfaces	– Serial (Baudrate up to 115'200) – USB Type A and mini B, – Bluetooth® Wireless, class 1, 150 m – > 1000 m (with TCPS29)	✔ ✔ ✔ O
Data formats	GSI / DXF / LandXML / CSV / user definable ASCII formats	✔

Guide Light (EGL)		
Working Range (average atmospheric conditions)	5 m – 150 m	O
Positioning accuracy	5 cm at 100 m	O

Telescope		
Magnification	30 x	✔
Resolving power	3"	✔
Field of View	1° 30' (1.66 gon) 2.7 m at 100 m	✔
Focusing range	1.7 m to infinity	✔
Reticle	Illuminated, 10 brightness levels	✔

Keyboard and Display		
Keyboard and Display	Full Alpha-numerical keyboard with high resolution Black & White display, Graphics, 160 x 288 pixels, display illuminated, 5 brightness levels	✔
Position	Face I, Face II	✔O

Operating System		
Windows CE	5.0 Core	✔

Laserplummet		
Type	Laser point, 5 brightness levels	✔
Centering accuracy	1.5 mm at 1.5 m Instrument height	✔

Battery		
Type	Lithium-Ion	✔
Operating time [7]	approx. 30 hours	✔

Weight		
Total station including GEB211 and tribrach	5.1 kg	✔

Environmental		
Temperature range (operation)	–20° C to +50° C (–4° F to +122° F)	✔
	Arctic Version –35° C to 50° C (–31° F to +122° F)	O
Dust / Water (IEC 60529) Humidity	IP55, 95%, non condensing	✔

Leica FlexField plus Onboard Sofware		
Included Application Programs: Survey incl. Map View; Stake Out; Station Setup including: Resection, Local Resection, Helmert Re-section, Orientation (Angles & Coordinates), Height Transfer; Area (Plan & Surface); DTM Volume calculation; Tie Distance (MLM); Remote Height; Hidden Point; Backsight Check; Offset; Reference Line; Reference Arc; Reference Plane; Road 2D; COGO		✔
Extra Application Programs: Road 3D, Traverse		O

Theft protection		
mySecurity, PIN/PUK Code		✔✔

Model Comparison: Configurations & Options of Manual Total Stations

	TS02plus	TS06plus	TS09plus	Viva TS11
1" angular accuracy	–	O	O	O
Enhanced measurement accuracy to prism	1.5 mm + 2 ppm	1.5 mm + 2 ppm	1.5 mm + 2 ppm	1.0 mm + 1.5 ppm
Reflectorless measurement range	500 m option	500 m included/1000 m option	500 m included/1000 m option	500 m included/1000 m option
Display with graphics and display illumination	Black & White high resolution	Black & White high resolution	Q-VGA Color & Touch	Full-VGA Color & Touch
Full alpha-numerical keyboard with function keys	–	✔	✔	✔
Second Keyboard	O	O	O	O
Keyboard illumination	–	–	✔	✔
Electronic Guide Light	–	O	✔	✔
USB Type A and mini B	–	✔	✔	✔
Bluetooth® Wireless	–	✔	✔	✔
SD Card	–	–	–	✔
Imaging capability	–	–	–	O
Smart Station GNSS capability	–	–	–	O
Onboard software (package content)	FlexField plus (standard)	FlexField plus (advanced)	FlexField plus (full)	SmartWorx Viva (pro)

Legend:
1) Standard deviation ISO-17123-3
2) Overcast, no haze, visibility about 40 km; no heat shimmer.
3) Standard deviation ISO-17123-4
4) Prism Precise Fast mode
5) Under optimal conditions on Kodak Grey Card (90% reflective). Maximum range varies with atmospheric conditions, target reflectivity and surface structure.
6) Range > 500m 4mm+2ppm
7) Single Measurement every 30 second at 25° C. Battery time may be shorter if battery is not new. Internal battery GEB222.
8) Reflectorless measurement time may vary according to measuring objects, observation situations and environmental conditions.
9) with R500 option using Non-prism mode
10) with R1000 option using Non-prism mode

✔ Included
O Option
– Not available

The Second Plus:
Real Features, True Benefits

USB Stick
- For fast and easy transfer of data

Wireless Bluetooth
- For cable-free connection to data logger

PinPoint EDM
- The most precise in its class (1.5 mm + 2 ppm)
- Extremely fast (1 second)
- › 1.000 meters without prism
- Coaxial laser pointer and measurement beam

Electronic Guide Light
- For faster stake-out

Alpha-numerical keyboard
- Fast and error-free input

FlexField plus
- Modern and intuitive on-board software for higher productivity

Large high-resolution display
- At-a-glance viewing on the largest high-resolution display in its class

Useful tools
- A range of tools, such as a trigger key and laser plummet, speed up your work

Arctic version
- For use at −35°C (−31°F)

mySecurity
- Unique cloud-based protection against theft

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to play
the videos!**

Whether you want to survey a parcel of land or objects on a construc-tion site, determine measured points on facades or in rooms, gather the coordinates of a bridge or a tunnel – Leica Geosystems' total stations provide the right solution for every application.
They unite reliable results with easy operation and user-friendly applications. Our total stations are designed to meet your specific requirements. Modern technology enables you to work fast and productively, thanks to the straightforward and clearly structured range of functions.

– when it has to be right.

Swiss Technology
by Leica Geosystems

TQM
ISO 9001 / ISO 14001

**Total Quality Management –
our commitment to total
customer satisfaction.**

Distance meter:
(PinPoint R500 / R1000):
Laser class 3R in accordance
with IEC 60825-1 resp.
EN 60825-1

Laser plummet:
Laser class 2 in accordance
with IEC 60825-1 resp.
EN 60825-1

Distance meter:
(Prism Mode)
Laser class 1 in accordance
with IEC 60825-1 resp.
EN 60825-1

Guide light (EGL):
LED class 1 in accordance
with IEC 60825-1 resp.
EN 60825-1

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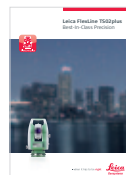
**FlexLine
TS02plus**
Brochure

**FlexLine
TS09plus**
Brochure
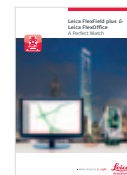
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Viva TS11
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**Original
Accessories**
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Heerbrugg, Switzerland

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- when it has to be **right**

**Leica
Geosystems**

RD8100™ Locator Specification

RD8100 Locator Specification

1. Product Summary

1.1 Product Descriptions:	**Multi-purpose Precision Locator** **Cable and Pipe Locator** **Locate System Receiver** **Multi-function Precision Locator**
1.2 Intended Use:	**Locating the position / path of buried pipes and cables** **Detecting and pinpointing insulation faults on buried pipes and cables** **Creating survey records of buried pipes and cable locations**
1.3 Standard Equipment:	**Locator** **Quickstart guide** **Mini USB 2.0 compliant data cable**

2. Performance

2.1 Sensitivity:	**6E-15 Tesla** **5µA at 1 meter (33kHz)**
2.2 Dynamic range:	**140dB rms/√Hz**
2.3 Selectivity:	**120dB/Hz**
2.4 Depth measurement precision[1]:	**± 3%**
2.5 Locate accuracy:	**± 5% of depth**
2.6 Active Locate filter bandwidth:	**± 3Hz, 0 < 1kHz** **± 10Hz, ≥ 1kHz**
2.7 Start-up time:	**<1 second**
2.8 Maximum depth readout[2]:	**Metric: Cable / Pipe: 30m Sonde: 19.5m** **Imperial: Cable / Pipe: 98' Sonde: 64'**

3. Locate Functions

3.1 Active Locate Modes:	**Five:** ▪ **Peak** ▪ **Peak+™ (choice of combined Peak & Guidance or Peak & Null)** ▪ **Guidance** ▪ **Broad Peak™** ▪ **Null**
3.2 Gain control	**Guidance Mode: Automatic** **Other modes: Manual gain using "+" or "-" with one touch to return to center (50% of Full Scale)**
3.3 Custom locate frequencies	**Up to 5 additional frequencies in the range 50Hz to 1kHz at 1Hz resolution**

3.4 Active locate frequencies:	Up to 24:					

RD8100 MODEL	PXL	PXLG	PDL	PDLG	PTL	PTLG
Custom frequencies	5	5	5	5	5	5
ELF (98/128Hz)			●	●	●	●
512Hz			●	●	●	●
570Hz			●	●	●	●
577Hz	●	●	●	●	●	●
640Hz	●	●	●	●	●	●
760Hz			●	●	●	●
870Hz	●	●	●	●	●	●
920Hz			●	●		
940Hz	●	●	●	●	●	●
1090Hz					●	●
1450Hz					●	●
4kHz (4096Hz)	●	●				
8kHz (8192Hz)	●	●	●	●	●	●
8440Hz					●	●
9.8kHz (9820Hz)			●	●	●	●
33kHz (32768Hz)	●	●	●	●	●	●
65kHz (65536Hz)	●	●	●	●	●	●
82kHz (82000Hz)					●	●
83kHz (83077Hz)	●	●	●	●	●	●
131kHz (131072Hz)	●	●	●	●	●	●
200kHz (200000Hz)	●	●	●	●	●	●

3.5 Sonde Frequencies:

All models: Four
- 512Hz
- 640Hz
- 8kHz (8192Hz)
- 33kHz (32768Hz)

3.6 Fault Find:

Locate insulation sheath faults on pipes and cables to 10cm / 4" accuracy using the accessory A-Frame and a compatible transmitter

RD8100 MODEL	PXL	PXLG	PDL	PDLG	PTL	PTLG
8kHz Fault Find			●	●	●	●
CD Fault Find			●	●	●	●

3.7 Current Direction™ (CD) Signal Pairs:

Confirm operator is following the target pipe or cable with CD arrows and a compatible transmitter

RD8100 MODEL	PXL	PXLG	PDL	PDLG	PTL	PTLG
219.9Hz / 439.8Hz					●	●
256Hz / 512Hz			●	●	●	●
280Hz / 560Hz					●	●
285Hz / 570Hz			●	●	●	●
320Hz / 640Hz			●	●	●	●
380Hz / 760Hz			●	●	●	●
460Hz / 920Hz			●	●		
680Hz / 340Hz					●	●
800Hz / 400Hz					●	●
920Hz / 460Hz					●	●
968Hz / 484Hz					●	●
1168Hz / 584Hz					●	●
1248Hz / 624Hz					●	●
4096Hz / 8192Hz 4kCD			●	●	●	●

3.8 Passive Locate Modes:

RD8100 MODEL	PXL	PXLG	PDL	PDLG	PTL	PTLG
Power	●	●	●	●	●	●
Radio	●	●	●	●	●	●
CPS (Cathodic Protection System)			●	●	●	●
CATV (Cable TV)			●	●	●	●
Passive Avoidance (Combined Power + Radio)			●	●	●	●

3.9 Power Filters™ function:

Switch out of sensitive Power Mode to locate on any of 5 individual mains harmonic frequencies:

HARMONIC	50 Hz regions	60 Hz regions
Primary	50 Hz	60 Hz
3rd	150 Hz	180 Hz
5th	250 Hz	300 Hz
7th	350 Hz	420 Hz
9th	450 Hz	540 Hz

3.10 Information displayed:

- Signal strength - moving bar graph and numeric value
- Mode indication
  (Peak, Null, Guidance, Broad Peak, Peak+ with option of Guidance arrows or Null arrows)
- Line or Sonde locate type
- Proportional left/right indication
- Compass: full 360° line direction indicator
- Accessories in use indication
- Accessory specific custom screen
- Depth and current readout (Line location)
- Depth readout (Sonde location)
- Gain level (in dB)
- Frequency selected
- Battery condition
- Speaker volume
- Operating frequency
- Bluetooth status
- GPS satellites in view (where fitted)
- GPS status (where fitted)
- Configuration menu and submenus
- Software version
- Last calibration date
- Survey measurement counter
- Current Direction mode indicator
- Current Direction arrows
- Fault Find mode indicator
- Transmitter communication status
- Transmitter standby status
- Strike*Alert*™ warning
- Overload warning

3.11 Audio output tones:

Power / Passive Avoidance / Radio modes:
Real Sound™ derived from detected electromagnetic signal

Peak / Peak+ modes and CPS / CATV modes:
Synthesized audio tone proportional to signal strength

Guidance mode:
Continuous tone when locator is to the left of target, intermittent tone when to the right of target

Null mode:
Synthesized Audio tone proportional to signal strength. Low pitch to left of target, high pitch to right of target

Strike*Alert* audio warning:
Audio feedback for menu navigation

3.12 Accessory locate functions:

Locator clamps: Used to identify individual target cable(s) in a bundle or cabinet using signal strength read-out

Stethoscopes: Used to identify individual target cable(s) in a bundle or confined space such as a cabinet using signal strength read-out

CD / CM clamp: Used to measure locate current and to confirm target cable using Current Direction

4. Locate Function Enhancements

4.1 Strike*Alert*:	Audio and visual warning when a cable or pipe less than 30cm deep is detected. Operates in Active and Passive locating modes
4.2 Dynamic Overload Protection™:	40dB, automatic ▪ Automatically manages the system gain to compensate for strong signals e.g. from mains power or substations, to enable accurate locating
4.3 Current Direction™ (CD):	▪ Measures the direction of current flowing in buried pipes or cables to ensure that an operator is able to identify and follow the target utility ▪ Provides operator with arrows indicating the direction of current flowing in the located pipe or cable to confirm that they are following the target utility
4.4 iLOC™:	Metric: Remote transmitter control from up to 450m away[3] Imperial: Remote transmitter control from up to 1400' away[3] Control transmitter frequency, power level and SideStep
4.5 SideStep™:	Enables locating where other signals are interfering, and without compromising the optimum locate frequency Remotely shifts the locate and transmitter frequency by several Hz, out of the bandwidth of other locate signals that may be interfering with the locate
4.6 Simultaneous depth and current readout:	Both utility depth and locate signal current are displayed simultaneously, giving the operator more information to help them to follow the target utility
4.7 Survey Measurements:	Store up to 1,000 survey points within the locator, and append GPS data from internal GPS (if fitted) or external GNSS sources over Bluetooth® Export data immediately or as a batch over Bluetooth
4.8 Fault Find:	Apply a Fault Find signal with a Tx-5 and Tx-10 transmitter, then use an accessory A-Frame to detect and pinpoint insulation faults Fault find accuracy: Metric: 100mm Imperial: 4"
4.9 4kHz locate frequency and 4kHz CD:	Designed for tracing higher impedance lines such as twisted pair telecoms or street lighting over distance Combine with Current Direction to help trace the target utility through dense or complex infrastructure
4.10 Peak+ mode:	Use the accurate Peak bargraph, and add either proportional Guidance arrows for faster locating, or Null arrows to check for the presence of distortion
4.11 Integrated GPS option:	Faster surveying using integrated GPS – no need for a separate hand-held device

5. Configurability

5.1 Option selection:	All options can be enabled or disabled on the locator or using the RD Manager PC software
5.2 Languages supported:	Fourteen: English, French, German, Dutch, Polish, Czech, Slovakian, Spanish, Portuguese, Swedish, Italian, Turkish, Russian, Hungarian
5.3 Mains power network options:	50 Hz or 60 Hz
5.4 Mode selection:	All locate modes with the exception of Peak Mode can be individually enabled or disabled
5.5 Active frequency selection:	All active frequencies available can be individually enabled or disabled
5.6 Passive mode selection:	All passive modes can be individually enabled or disabled
5.7 Strike*Alert*:	Enable / disable
5.8 Peak+ arrow selection:	Guidance arrows or Null arrows Selected using the locator menu or with a long press of the antenna key
5.9 GNSS ('GPS') settings:	Internal / External (connect over Bluetooth) / Off / Reset SBAS On / Off
5.10 Bluetooth:	On / Off
5.11 Data export protocols supported:	PPP / choice of 3 ASCII formats. Optionally append positional data
5.12 Time / date setting:	Correct or update locator real-time clock using the RD Manager PC software or GNSS signals
5.13 CD Reset:	Reset CD phase analysis with a single long press of the frequency key

6. Connectivity

6.1 Wireless connections:	Bluetooth class 1
6.2 iLOC™ remote transmitter control range[3]:	**Metric:** Up to 450m **Imperial:** Up to 1400'
6.3 iLOC remote transmitter control functions:	Set transmitter frequency Set transmitter power output level Transmitter standby SideStep
6.4 Wired connections	**Mini-USB:** Connect to a PC to configure and update locator, and to retrieve usage log and survey measurement data **3.5mm Stereo jack:** Connect wired headphones **Accessory port:** Connect Radiodetection accessories

7. Data capabilities and GNSS ('GPS')

7.1 On-board GNSS ('GPS') module option:	GNSS data automatically added to Survey Measurements every time locate data is saved, and every second on usage-logging data Accurate to 3m CEP with SBAS enhancement available Links to GPS, GLONASS and Galileo networks Positional data enhancement systems (where available) ▪ WAAS – North America ▪ EGNOS – Europe ▪ MSAS – Japan ▪ SBAS (satellite based augmentation system) SBAS can be enabled or disabled in locator menu
7.2 Link to external GNSS ('GPS'):	Over Bluetooth ▪ Connect to an external GNSS enabled device to combine survey measurements with that device's GNSS data on the external device
7.3 External GNSS position read-in to locator memory:	Over Bluetooth from compatible mobile device / PDA running the SurveyCert+™ app. ▪ Connect to an external GNSS device to read positional positioning from that device and combine with the locator's survey measurement data on board the locator
7.4 Survey measurement capacity:	Up to 1,000 data records

7.5 Survey measurement data captured:	**Standard data:** Log # Survey Reference Antenna Mode Depth Current (mA) Frequency in use (Hz) Sonde/Line Signal Strength (dBµV and %) Signal Strength (%) Gain Setting (dB) Compass (deg) Arrow readout CD Phase (deg) Accessory Type Battery level Volume Overload Flag **Usage-Logging Units:** Date and Time	**With Internal or External GNSS Fix:** GPS Mode GPS Date and Time GPS Distance (m) Latitude Angle (deg) Latitude Direction Longitude Angle (deg) Longitude Direction GPS Fix Satellites in use Horizontal Dilution Altitude Value (m) Altitude Units Geoid Value (m) and Units DGPS Time DGPS ID Time Reference GPS Mode GPS Date and Time GPS Distance (m) Latitude Angle (deg)

7.6 Survey measurement export options:	Bluetooth – 'live,' per measurement Bluetooth – batch export USB – selectable / batch export
7.7 Bluetooth survey measurement data protocol options:	PPP ASCII (choice of 3 formats) Optional GPS data appended

7.8 Usage-logging and GNSS ('GPS'):	RD8100 MODEL	PXL	PXLG	PDL	PDLG	PTL	PTLG
	Usage-logging		●		●		●
	On-board GNSS ('GPS')		●		●		●

7.9 Usage-logging memory:	4 GB
7.10 Usage-logging capacity:	Over 500 days, measured at 8 hours use per day
7.11 Usage-logging capture rate:	1/ second

7.12 Usage parameters logged:	Serial number Log reference and id Operating mode Locate frequency Sonde/line Signal strength Gain setting Depth Current Accessory in use Antenna mode Arrows readout Compass angle CD phase Overload status Dynamic Overload Protection Status	Keys pressed Audio status Volume Menu in use Battery status User warnings status Strike*Alert* status Bluetooth status Fault find arrow Sidestep status Language Depth units Power setting Compass setting CD reset status **Logging Units:** Date and time	**With a GNSS fix:** Latitude Longitude Altitude GNSS mode GNSS date and time Horizontal Dilution Geoid DGPS Time and ID Geoid Units GNSS fix Number of satellites Altitude units Time reference

8. Power options

8.1 Alkaline battery options:	2 × D-Cell (MN1300 / LR20) alkaline batteries (standard)
8.2 Rechargeable battery options:	Custom Lithium-Ion (Li-Ion) battery pack 2 × D-Cell (MN1300 / LR20) Nickel Metal Hydride (NiMH) batteries
8.3 Battery run-time (continuous)[4]:	Li-Ion pack: 35 hours 2 × Alkaline D-Cells 13 hours
8.4 Battery chemistry identification:	Lithium-Ion pack: Automatic sensing NiMH / Alkaline: Software switchable
8.5 Charging options (Li-Ion pack):	Mains charger: 100-250 Volts AC, 50/60 Hz Automotive charger: 12-24V DC
8.6 Charging time (Li-Ion pack):	3 hours to 80% from empty with maintenance trickle charging thereafter

9. Physical Characteristics

9.1 Design:	Ergonomic, balanced and lightweight design for comfortable use during extended surveys
9.2 Construction:	Injection Molded ABS Plastic
9.3 Weight:	**With Lithium-Ion battery pack fitted:** Metric: 1.8kg Imperial: 4.0lb **With D-cell alkaline batteries fitted:** Metric: 1.9kg Imperial: 4.2lb

9.4 Ingress Protection rating:	IP65 Protected against dust ingress and jets of water[5] applied from any direction
9.5 Display type:	High contrast custom made monochrome LCD
9.6 Audio options:	Built-in waterproofed speaker 3.5mm headphone socket
9.7 Operating temperature[6]:	Metric: -20 to 50°C Imperial: 14 to 122°F
9.8 Storage temperature:	Metric: -20 to 70°C Imperial: 14 to 158°F
9.9 Unit dimensions:	Metric: 648mm × 286mm × 125mm Imperial: 25.5" × 11.3" × 4.9"
9.10 Shipping dimensions:	Metric: 700mm x 260mm × 330mm Imperial: 27.6" x 10.2" x 13"
9.11 Shipping weight (with batteries fitted):	Metric: 2.6kg Imperial: 5.7lb

10. RD Manager™ Supporting PC Software

10.1 Operating System Compatibility:	Microsoft® Windows® XP, 7, 8, 8.1, 32 and 64-bit versions
10.2 Locator system compatibility:	Radiodetection RD8100 Precision Locators RD7000+ and RD8000 Cable, Pipe and Marker Locators
10.3 Functions:	▪ Locator configuration ▪ eCert™ remote calibration certification ▪ Factory calibration certificate retrieval ▪ Usage-logging data collation and export ▪ Survey measurements data collation and export ▪ User account management ▪ CALSafe™ maintenance schedule enforcement ▪ Product registration for extended warranty ▪ Locator software update ▪ Contact Radiodetection ▪ Book a service
10.4 Data export formats:	.kml for Google® Maps .csv for database and spreadsheet applications .xls / .xlsx for Microsoft® Excel®
10.5 KML data export options:	Filter usage-logging and survey measurement points on Google® maps. Select data to be tagged. Customize icon type / color, label type / color, line type / color

11. Warranty and Maintenance

11.1 Manufacturer's warranty duration:	3 years standard, on registration
11.2 Recommended calibration and maintenance schedule:	Annual, or at the beginning / end of a lease period if earlier
11.3 eCert remote calibration:	▪ Remote calibration certification using an internet connection to Radiodetection ▪ Recommended schedule: annual, or at the beginning / end of a lease period
11.4 CALSafe™:	▪ Can be enabled to prevent the locator operating when beyond a defined calibration / maintenance schedule ▪ Disabled by default ▪ 30-day countdown to calibration due date
11.5 Enhanced Self-Test:	On-unit Applies test signals to locate circuitry to confirm correct operation, as well as the typical tests for screen and DSP functions. Recommended schedule: weekly, or before each use.

11.6 Storage recommendation:	Store in a clean and dry environment.	
	Ensure all terminals and connection sockets are clean, free of debris and corrosion and are undamaged	
11.7 Cleaning:	Clean with a soft, moistened cloth.	
	Do not use	
	▪ Abrasive materials or chemicals	
	▪ High pressure jets of water	
	If using this equipment in foul water systems or other areas where biological hazards may be present, use an appropriate disinfectant.	

12. Certification and Compliance

12.1 Standards:		
Safety:	EN 61010-1:2010	
EMC:	EN 61326-1:2013	
	EN 300 330-2 (V1.5.1)	
	EN 300 440-2 (V1.4.1)	
	EN 301 489-3 (V1.6.1)	
	EN 301 489-17 (V2.2.1)	
Environmental:	EN 60529 1992 A2 2013	
	EN 60068-2-64:2008 Test Fh	
	ESTI EN 300 019-2-2:1999 (per table 6)	
	EN 60068-2-27:2009 (Test Ea)	
	ESTI EN 300 019-2-2:1999 (per table 6)	
12.2 European directives:	R&TTE Directive 1999/5/EC	
	Low Voltage Directive: 2006/95/EC	
	EMC Directive: 2004/108/EC	
	Declaration of conformity is available from www.radiodetection.com	
12.3 Radio:	FCC, IC	
12.4 Environmental:	WEEE compliant	
	ROHS compliant	
12.5 Manufacturing:	ISO 9001:2008	

13. Compatible Accessories

Accessory	Part description	Part number
13.1 Lithium-Ion battery packs	Li-Ion rechargeable battery mains kit (Includes mains charger)	10/RX-MBATPACK-LION-K
	Li-Ion rechargeable battery pack (no charger)	10/RX-BATPACK-LION
13.2 Lithium-Ion battery chargers	Li-Ion automotive charger	10/RX-ACHARGER-LION
	Li-Ion mains charger	10/RX-MCHARGER-LION
13.3 Alkaline battery trays	2 × D Cell battery tray (MN1300 / LR20)	10/RX-2DCELL-TRAY
13.4 Transportation and storage accessories – *For combined locator and transmitter*	Soft Carry Bag	10/LOCATORBAG
	Wheeled Flight Case	10/RD7K8KCASE
	Hard Case	10/RD7K8KCASE-USA
13.5 Locator signal clamps – *For identification and location of utilities*	Metric: 50mm Locator Clamp	10/RX-CLAMP-50
	Imperial: 2" Locator Clamp	10/RX-CLAMP-2
	Metric: 100mm Locator Clamp	10/RX-CLAMP-100
	Imperial: 2" Locator Clamp	10/RX-CLAMP-4
	Metric: 130mm Locator Clamp	10/RX-CLAMP-130
	Imperial: 5" Locator Clamp	10/RX-CLAMP-5
	CD and Current Measurement Clamp	10/RX-CD-CLAMP

Accessory	Part description						Part number
13.6 Signal stethoscopes *– To locate and identify individual utilities e.g. within walls, congested areas or when cables/utilities are in close proximity to each other*	High Gain Stethoscope Large Stethoscope Small Stethoscope CD Stethoscope						10/RX-STETHOSCOPE-HG 10/RX-STETHOSCOPE-L 10/RX-STETHOSCOPE-S 10/RX-CD-STETHOSCOPE

13.7 Sondes *Battery powered signal transmitters for tracing or locating non-conductive utilities*		Diameter		Range		Freq (Hz)	
		mm	In	m	Ft		
	S6 Microsonde	6	¼	2	6½	33k	10/SONDE-MICRO-33
	S9 Minisonde	9	3/8	4	13	33k	10/SONDE-MINI-33
	S13 Super Small Sonde	13	½	2	6½	33k	10/SONDE-S13-33
	S18 Small Sonde	18	¾	4	14	33k	10/SONDE-S18A-33
	Standard C-Sonde	39	1½	5	16½	33k	10/SONDE-STD-33
						8	10/SONDE-STD-8
						512	10/SONDE-STD-512
	Slim Sonde	22	7/8	3.5	11½	33k	10/SONDE-SLIM-33
	Sewer Sonde	64	2½	8	26	33k	10/SONDE-SEWER-33
	Super Sonde	64	2½	15	50	33k	10/SONDE-SUPER-33
	Flexi Sonde	23	7/8	6	20	512	10/SONDE-BENDI-512

Accessory	Part description	Part number
13.8 Submersible antennas:	640 / 512Hz Submersible DD Antenna 8kHz Submersible DD Antenna	10/RX-SUBANTENNA-640 10/RX-SUBANTENNA-8K
13.9 FlexiTrace™ *– Use with a transmitter to trace small diameter pipes*	FlexiTrace 50m / 165' FlexiTrace 80m / 260'	10/TRACE50-GB 10/TRACE80-GB

13.10 Flexrods *– Fibreglass rod used for propelling Radiodetection sondes through pipes to trace the path and locate blockages*	Length		Diameter		
	m	Ft	mm	In	
	50	160	4.5	3/16	10/FLEXRODF50-4.5
	80	260	4.5	3/16	10/FLEXRODF80-4.5
	50	160	7	¼	10/FLEXRODF50-7
	100	320	7	¼	10/FLEXRODF100-7
	150	485	7	¼	10/FLEXRODF150-7
	60	195	9	3/8	10/FLEXRODF60-9
	120	390	9	3/8	10/FLEXRODF120-9

Accessory	Part description	Part number
13.11 A-Frame *– Used for locating sheath faults on cables and coating defects on pipelines*	A-Frame (includes A-Frame Lead) A-Frame Bag	10/RX-AFRAME 10/RX-AFRAME-BAG
13.12 Headphones	Recommended for use in noisy environments	10/RX-HEADPHONES
13.13 Warning Triangle	Three sided folding warning sign	10/WARNING-TRIANGLE
13.14 PDAs	GPS PDA with SurveyCERT™+	10/RX-PDA
13.15 Calibration Certificates	Locator Calibration Certificate, per unit (request with initial locator order) eCert™ Calibration Credit	97/RX-CALCERT 10/RX-ECERT

●   Available feature